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Cover Image:

Short Empire Flying Boat G-ADVB Corsair moored on the Sea of Galilee at Tiberias in Palestine, on Friday January 10th 1941. Corsair was returning from Rose Bay in Sydney Harbour, and carrying lots of mail for all those Australian soldiers stationed in Palestine and fighting in North Africa.

Photo by (then) Lt. W. Neville Haughton VX13872

This is a free magazine covering stories and news items about industrial and engineering heritage in Australia and elsewhere. It is published online as a down-loadable PDF document for readers to view on screen or print their own copies. EA members and non-members on the EHA mailing lists will receive emails notifying them of new issues, with a link to the relevant Engineers Australia website page.

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Finding past issues of the EHA Magazine

It used to be easy to find a particular past issue of the EHA Magazine. If you typed EHA Magazine into the search box of the Engineers Australia website Home Page, all the magazines came up as a list of PDF files, in order of publication, from Vol.1 No.1 in December 2013, through to the most recent issue when you did the search.

The same query now will bring you separate links to all of the EHA magazines that have been published so far (amounting to 29 before this issue). But the list is all out of order, starting with Vol.3, No.9. You will have to search all through the list to find the magazine you want to look at.

However, steps are being taken, by the EHA National Committee, to make all engineering heritage publications more accessible in the future.

From the Editor

Editorial

This issue starts with a notice about the Call for Nominations for this year's Engineering Heritage Australia's John Monash Medal. Following that is a story that has some good news about a possible "New Life" for the Duck Reach Hydroelectric Power Scheme in Launceston, Tasmania. The author, Bruce Cole – a stalwart of Engineering Heritage Tasmania – sent me the story, with pictures, as a potential article for the September 2022 EHA Magazine. His email arrived on the same day, 25th September, that I had sent off the September 2022 issue of the magazine, ready for publishing. Bruce had missed that boat. I have to apologise to Bruce now for my rudeness in not replying to his email – so many things happened to me in the following days, that I never even got around to opening his email until months later. I had entirely forgotten its existence.

I started to get ill a few days after the 25th, went to hospital emergency on 1st October, was sent home, but returned there and was admitted on 4th October. I never got a believable diagnosis from the hospital, and finally managed to escape at the start of November. But I never got back to work in 2022 – I was still under the weather, and in hospital, via ambulance, in mid-December for an abdominal operation. Christmas and New Year away from home wasn't fun, but after a total of six weeks in hospital, it was good to get home again in early January.

Back to work about the 18th January, and first job, guess what? Catch up with emails! And there was Bruce's story, patiently waiting for me. And there, in my EHA Magazine files already, waiting to be fact checked, re-formatted and edited, were three of the other stories in this EHA Magazine. I owe many thanks to the authors, a few of whom have been waiting some time to be published.

Bill Phippen – the author of many great stories in EHA Magazine over the years – sent me, after my request, the story about the Harris Creek Railway Bridge at Holsworthy near Sydney, in May 2021. I was interested to learn about its connection with the "German Concentration Camp" an internment camp at Holsworthy during WW1, but fascinated to learn that it was the same place where, about 45 years later, my great friend Lt. (later Colonel) Peter Robinson FIEAust., an officer in RAEME, was encamped, when my partner Carl and I were living in Oatley, not far away. And then, when I started getting involved with archiving and scanning my parent's "War Letters" about 40 years later again (see the next story *Short Empire Flying Boat G-ADVB Corsair*), I had discovered that in 1939 my Dad, soon after he joined the 2nd4th Field Regiment, was sent to an Artillery School at Holsworthy. I think he travelled there by train, so he probably passed over the Harris Creek Bridge.

The origin of my Corsair story is fully explained in the text, so I can pass on to the follow-on page about the Catalina Flying Boats. That brief story reminded me of an old friend from the 1940s and 1950s, a Catalina pilot who was a Flight Lieutenant in 43 Squadron RAAF, stationed at Rathmines Base on Lake Macquarie, NSW at the end of WW2. Now I am trying to find where else he was and what adventures he had, flying those Catalinas.

Brian Beconsall sent me the text and some images for the next story, *The Walter Taylor Suspension Bridge* in May 2022. After much discussion and some rewrites, I received the final version of the story on "that day" in September 2022 – too late for the September magazine. I was glad to find the correspondence and the text and images, waiting for me when I got back to work in late January 2023.

The last story in this issue was another one which missed publication in the September 2022 issue. The author, Keith Baker – an engineer and friend – sent it to me in August 2022, but I already had a full house. Keith is an electrical engineer and lives in Canberra, so he was well placed to write the story about the *Belconnen Naval Transmitter Station*. Keith is another stalwart of Engineering Heritage Australia – a member of the EH Canberra Branch, has been Chair of the EHA National Committee and wrote a book about *A Century of Canberra Engineering*, published by EA in 2013. Keith, and Bruce Cole, are both *previous recipients of the John Monash Medal* referred to on page 4 of this issue. You can look up all the citations on the EHA web page listed there.

I take this opportunity to express my thanks to Keith, for all his help and critical comment over the past decade. Why now? In 2012, I was asked to become the editor of the (then) EHA Newsletter. I offered to produce an online magazine instead, and my offer was accepted. I have been producing the EHA Magazine for 10 years now – and not just editing it, but doing the lot, from original invention of the magazine, its design and layout, chasing all the contributions and finding images, fact checking, often rewriting, and assembling the final results – almost a full time job. There are a lot of other things I want to do with my life, such as writing books, and not much time left to do them in (I am 85), so I have decided that this will be the last EHA Magazine that I produce. I would like to thank the many authors who have contributed so much to the success of the magazine, and I thank my engineer partner Carl Doring, who has become a highly skilled (and unpaid) copy editor. I wish all my wonderful readers farewell. If you would like to communicate, try doring.belgrano@bigpond.com

From the Editor, Margret J. Doring, FIEAust., CPEng., MICOMOS.

The E.H.A. John Monash Medal

Call for Nominations – closing 4th July 2023

What is the John Monash Medal ?

The John Monash Medal was approved by the Council of Engineers Australia in 1976. It perpetuates the memory of General Sir John Monash who is recognised as Australia's greatest military commander, and who was an engineer of exceptional and diversified talents. In 1921 Sir John Monash was appointed Chairman of the State Electricity Commission of Victoria and he was responsible for the Latrobe Valley power scheme. He was awarded the Peter Nicol Russell Memorial Medal in 1929.

The John Monash Medal was originally awarded for the best paper on engineering related to General Engineering interests, with the award being first made in 1979. In 2002, the John Monash Medal was re-designated as an award for Engineering Heritage.

The John Monash Medal is now awarded by Engineering Heritage Australia (EHA) and recognises outstanding contributions made by an individual towards increasing awareness, and conservation, of Australia's engineering heritage. Worthy contributions considered for the award include promoting awareness of engineering heritage matters within the profession or the community, recording and documenting, and conserving or adapting engineering heritage. The award is open to members and non-members of Engineers Australia.



Sir John Monash, Engineer & Businessman.
Source: The Wagga Advertiser, date unknown.

Criteria for nomination eligibility – Engineers Australia says:

Any member of Engineers Australia can be nominated including international members. Nominations are accepted from non-members however it's preferred that their achievements be supported by membership of Engineers Australia or one of the learned societies. A nominee's membership status may be considered when choosing an award winner.

Criteria the Nominee should meet

The nominee should have, over a considerable period of time, made an outstanding contribution to Engineering Heritage in Australia (EHA), through one or more of the following:

- the raising of awareness of engineering heritage within the profession;
- the promotion of engineering heritage within the community;
- the recording and documentation of engineering heritage;
- the conservation of engineering heritage;
- such other contribution to engineering heritage as EHA may consider worthy of recognition.

How to go about nominating someone? On the EA website, go to:

https://www.engineersaustralia.org.au/about-us/excellence-awards-program/achievement-awards?utm_source=website-homepage&utm_medium=banner&utm_campaign=EAEA23#accordion-135706

and click on "Nominate for the John Monash Medal."

Previous recipients of the John Monash Medal – from the Editor

Engineering Heritage Australia has assembled a list of previous awardees, with the years the awards were made, and the citations for each person. If you want to have a look, go to: <https://eba.mywikis.wiki/wiki/Awards> Like my dear cousin Keld Fenwick – former editor of the Newcomen Society Links magazine, who wrote about us in the December 2008 issue – I have to declare an interest here: my partner Carl Doring and I were joint winners of the John Monash Medal in 2008. Carl is a mechanical engineer, but has never been a member of Engineers Australia. I am very happy it made no difference to the judges.

Sir John Monash, and his statue by Peter Corlett OAM at Monash University, feature in the June 2015 issue of EHA Magazine at: <https://www.engineersaustralia.org.au/sites/default/files/2022-06/eba-magazine-v1-7.pdf>

Duck Reach Hydroelectric Power Scheme

in Launceston Tasmania – a new life

By Bruce Cole

Past history

The design and construction of the Duck Reach Power Scheme in the 1890s was a huge commitment for the Launceston City Council. The initial aim was to harness the hydro-electric potential of the nearby South Esk River to light the streets of the city. The generators would produce both DC power for arc lights and AC for incandescent lights and electric motors.

The scheme was located on a big bend in the river. Water was diverted into a tunnel across the bend and down the hillside in a penstock to the station on the river bank below the bend. Five small machines produced the DC power, while three larger machines produced AC. The station output was 360kW. Transmission lines conveyed the power to a substation in the city.



This 1905 photograph of the Duck Reach Power Station building, shows the penstock, the timber haulageway used to bring the machines down from above, and a suspension footbridge over the South Esk River. Source not provided.

In response to the rapidly growing demand for electricity, more water was delivered via a second penstock from the tunnel in 1905, and a timber flume was built from the tunnel entrance all the way around the river bend to the tunnel outlet in 1921. More and larger machines were progressively installed raising the station output to 2000kW by 1921. The Duck Reach scheme enabled the city to attract new industries.



The 1929 flood. The suspension bridge was washed away. The Duck Reach Power Station building (top left) was inundated and damaged, plunging Launceston into darkness.

Photo from the Duck Reach Museum website [<http://duckreach.com.au/the-flood/>].

Tragedy struck in 1929 when the power station building was badly damaged by an enormous flood in the South Esk River. The flood also caused serious flooding in the City of Launceston. Fortunately the (then) Tasmanian Hydro-Electric Department had built a transmission line from the Waddamana Power Station to Launceston in 1921, and this maintained the power supply to Launceston while the Duck Reach Power Station was being reconstructed.

Duck Reach Hydroelectric Power Scheme

In 1944 the Duck Reach station was taken over by the Tasmanian Hydro-Electric Commission (aka the Hydro). Duck Reach continued to provide sterling service until 1955, when its water supply was diverted to the new Trevallyn Power Station. Duck Reach Power Station was decommissioned.

Due to continued vandalism the Hydro removed the machines and equipment from the Duck Reach station in 1956 and donated them to various institutions. The station building gradually fell into disrepair. In the Australian bi-centenary year of 1988, funds were obtained to re-roof the building, improve access to the suspension bridge and re-install one small machine as a static exhibit. The result was a large building with very little inside it.

The present

For some time lobby groups in Launceston have been keen to improve the visitor experience at the station. A grant of funds enabled a 10-minute video to be prepared and displayed on an inside wall, to tell the Duck Reach story when visitors enter, and the interpretation panels have been upgraded.

Currently a lobby group led by Gus Green persuaded the Hydro to release one small 12kW Duck Reach machine from



Visitors watching the 10-minute video, inside the Turbine Hall of the Duck Reach Power Station during the 120 year celebrations on 10th December 2015. Original foundation bolts can be seen at right, and at the far end, a small original machine. This was returned to Duck Reach c1988. Photo source not provided.



This little red turbine was removed from Duck Reach in 1956, and was on display in the Waddamana Museum until recently, when it was returned by the Hydro and reinstalled at Duck Reach via helicopter. 2019 Photo from HEC Waddamana.

were founded when they were on display near Trevallyn Dam. The blocks have been removed, the machines have been carefully dismantled into lighter components, cleaned up and painted.

the Waddamana Museum and that turbo-generator has been lifted into Duck Reach station by helicopter. This machine is brightly painted and has some of its casings cut away so that the inside workings can be seen.

The lobby group has long held the aim to get an original 445 hp turbine and 300 kW alternator out of the bulk storage shed of the Queen Victoria Museum (in Launceston) and reinstall them in the Power Station building. This work has started. The machines have been transported to a workshop in Launceston complete with the large concrete blocks on which they



The turbine, generator and governor on the truck are the 445hp/300kW machine being transported from the Queen Victoria Museum bulk store to the workshop for disassembly, clean up and painting. Photo source not provided.

Duck Reach Hydroelectric Power Scheme

A significant problem for the re-installation is the lack of road access to the site. To convey the parts across the river to the station, the plan is to build a 5-tonne cableway, and work on this has begun. In the station there is an existing walkway through the length of the building which will have to be modified to make room for the machines. The intention is to place the machines on their original holding down bolts, which still exist in the station. The inlet pipe between the station wall to the gate valve on top of the turbine is missing and will have to be measured up and fabricated.

Julian Burgess wrote a book called *Duck Reach and Launceston's Electric Light* which was launched in 2016. He has now produced a second and upgraded edition, launched in November 2022. It contains the full story and a myriad of historical photographs.

The future

There is a proposal by a private company (by agreement with the Hydro), to install a mini-hydro generator in the station, using water released from Trevallyn Dam. This will involve delivering the water to the station via a smaller pipe from the tunnel outlet down the hillside inside an existing penstock. The power produced will be sold to the Hydro.

If this occurs, it is also proposed to divert a small amount of water to the reinstalled 1905 machine to enable it to generate enough power to light the station. There will be technical problems to be overcome, so we live in hope at this stage. If the plans are successful we would then have a live exhibit instead of a static one.

Duck Reach and Launceston's Electric Light

From the Editor.

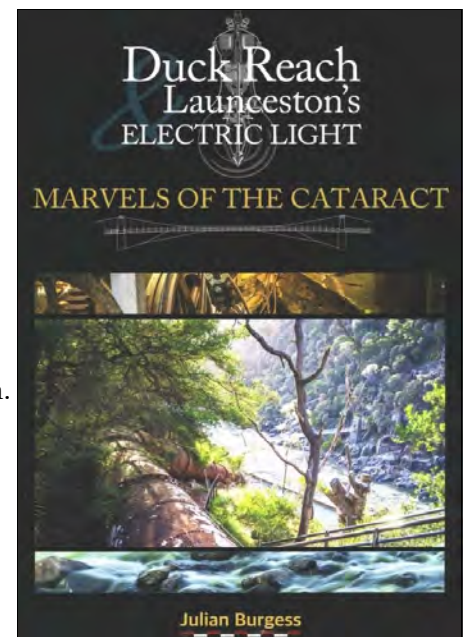
A review of Julian Burgess' 2016 book *Duck Reach and Launceston's Electric Light* appeared in the EHA Magazine, Vol.2 No.3, July 2016. The review, on page 23, can be found – at present – at:

<https://www.engineersaustralia.org.au/sites/default/files/2022-06/cha-magazine-v2-3.pdf>

In 2022, a second edition of *Duck Reach Launceston's Electric Light*, with additional material titled *Marvels of the Cataract* (or is this another book published in the same volume?). Quite by chance, a colleague, Miles Pierce, sent me a notice about the new book, which I can reprint here:

A new 220 page book on the pioneering Duck Reach hydroelectric scheme, that from 1895 supplied electricity for public and private electric lighting in Launceston Tasmania, has been published by Christopher (Gus) Green, OAM. Gus has long championed the heritage of this scheme and is spearheading current efforts to return a preserved 300 kW Kolben water turbine alternator set to the restored former power station building.

The book, while including much of the material in the 2016 edition, also covers the development of the downstream Cataract Gorge for recreation and tourism, and the bridging of the river mouth in Launceston. The soft cover book reproduces many contemporary photographs of the original and later versions of the power station and its generating plant, along with the transmission and distribution works and the early introduction of electric trams. There are also a number of early photographs of the original 1864 wrought iron arch bridge across the South Esk River mouth, and the erection of its duplication at the beginning of the twentieth century. As in the 2016 edition, a copy of Miles Pierce's 2007 engineering heritage paper on the Duck Reach scheme is included in the new book.



Duck Reach Launceston's Electric Light, Marvels of the Cataract (2nd Edition) November 2022, is available from the Publisher, Christopher (Gus) Green, 5 Melford Place, Norwood, Tasmania, 7250. Ph 0408 355 561 Email prossergreen@vision.net.au — RRP \$55.00 plus postage Aust wide \$10.00.

The Harris Creek Railway Bridge and its Place in History

By Bill Phippen



Harris Creek bridge. The water and sewer mains which it carries were probably its salvation, as it is unlikely to have carried a train since 1930. A Bailey bridge deck has been added to convert it to a footpath. The road on the right is Heathcote Road, planned for an upgrade. Photo: John Oakes.

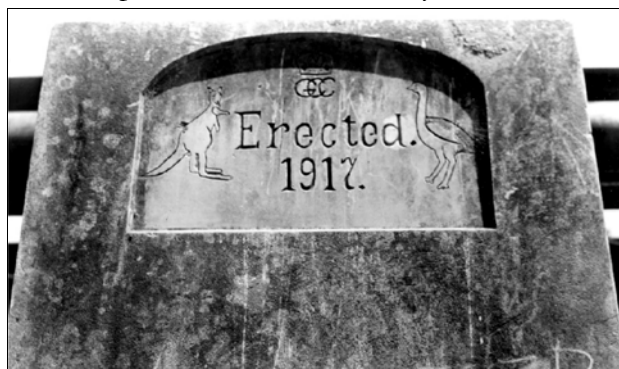
Plans by NSW Roads & Maritime Authority (now Transport for NSW) to upgrade Heathcote Road in south-western Sydney to a divided carriageway – and thereby demolish an old bridge across the minor watercourse of Harris Creek – prompted local heritage groups to campaign (successfully) for the bridge's retention. In June 2021 the bridge was recommended for inclusion in the State Heritage Register.

In an engineering sense the bridge is of little significance, being built of three simple 20 foot spans, made from 20 inch by 7½ inch rolled steel girders. These girders were second hand at the time of

construction in 1917, having been 'recovered from duplications'. The location of their original use is unknown.

The heritage significance of the bridge is that it was part of a now abandoned and largely lost railway which served the Australian military forces during the two World Wars and beyond – and very specifically – because it still carries, embossed in the top of the concrete of its low piers, the letters 'GCC'. These letters stand for 'German Concentration Camp' and mark an important, but little known aspect of Australian history – the internment of enemy aliens during the Great War.

Image at Right: Both piers of the bridge have the carefully embossed legend recording the date of construction, the letters GCC for the home of the workers, a kangaroo, an emu and a crown. The resemblance to the national coat of arms is odd, considering that the work was done by people who notionally at least were the enemies of Australia. Photo: ARHSnsw - 02367a.



Other relics of the internment camp do survive, as will be detailed later, but they are deep within a still operating military base and are thus not generally available for public viewing or inspection. In addition to the fact that the railway across the bridge served the camp, the people interned there built it. The first section of the railway to the military boundary was built by the NSW Railways, but the rest was the business of the Australian Army and therefore at least in part constructed by the internees of the GCC.

A large area of land (200 km²) across the then southern outskirts of Sydney between Liverpool and Heathcote had been bought by the Commonwealth for use by the army, as a result of a 1910 report by Lord Kitchener. The area closer to Liverpool was developed with a camp, an ordnance depot and more intensive uses, while the bulk of the area was given over, as it remains, to training areas and an artillery range.

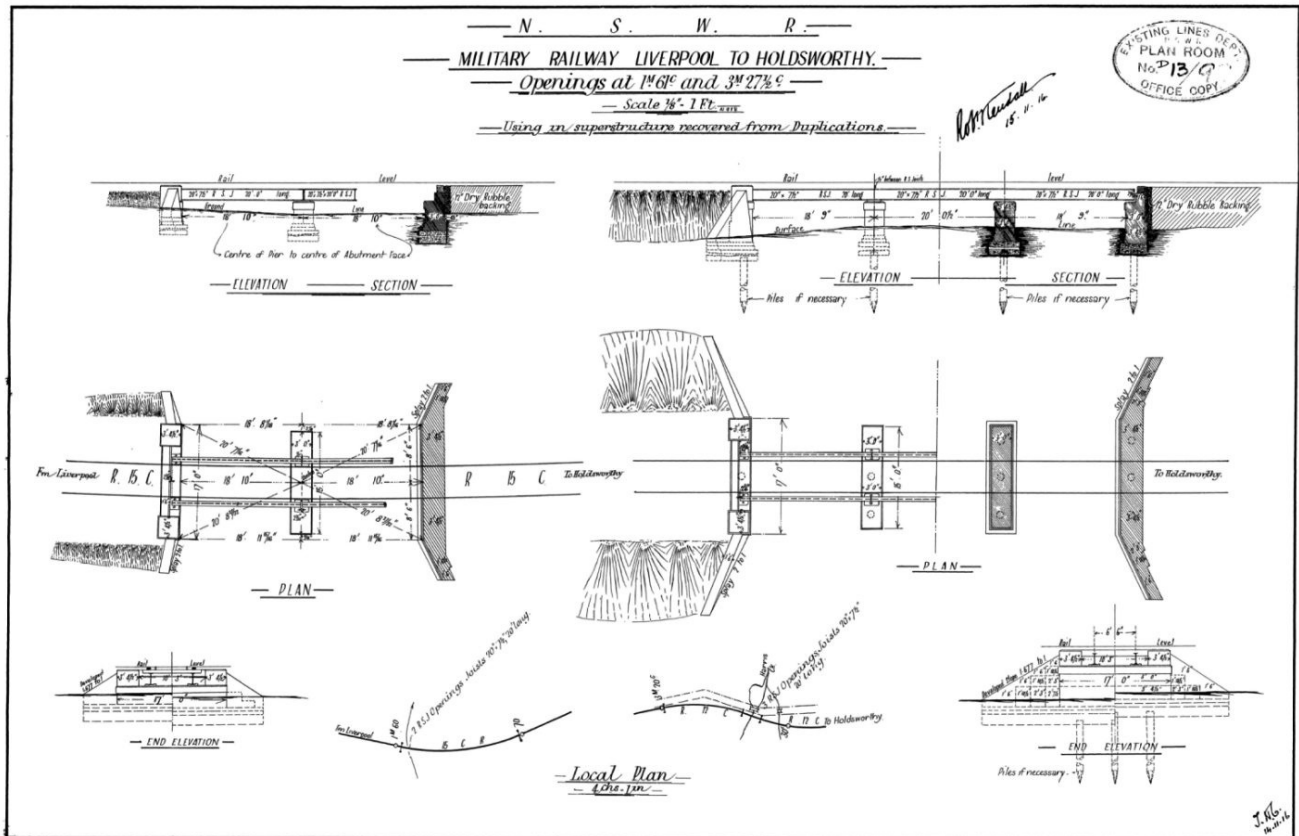


Internees building the railway line.

ARHSnsw - 874509.

The Harris Creek Railway Bridge

The camp was used during the earlier years of the Great War as a base for the training of new recruits. They accessed the rest of Sydney by means of the closest railway station, Liverpool just across the Georges River, though there are stories of them shortening their walk home by stopping the train using emergency facilities at more convenient locations.



Plans for the bridges at Harris Creek and another unnamed creek, later to become Anzac Creek. Although built by the Australian Army and the internees of the German Concentration Camp the plans are signed by Robert Kendall, NSW Engineer in Chief. Note the 'recovered from Duplications' in the title. Drawing from ARHSnsw.

After WW1 had started, in 1916, the NSW Railway Commissioners proposed a railway into the camp, at first as an extension of the Bankstown Line via East Hills, but the army's view that the line should be from Liverpool prevailed and the railway was opened on 21 January 1918. The wide and deep course of the Georges River

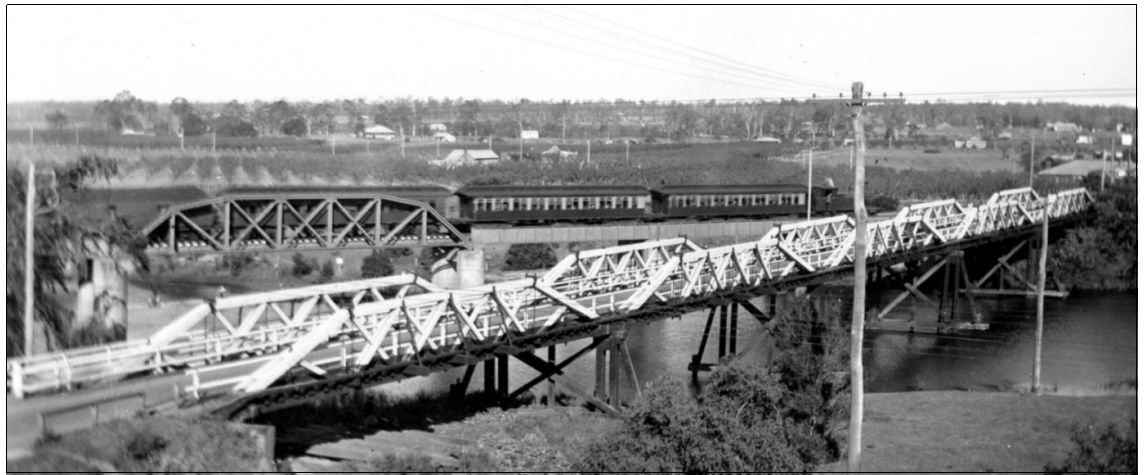


The Georges River Bridge in 1970. Liverpool station is beyond the left of the photo. The building with the tower is Liverpool Hospital. Note the plate web girder at the right is different from the rest. It came from Goulburn, the others from Rydal. Photo: Neville Hatcher ARHS 097205.

separated the station from the military land, and this was crossed on a long, high bridge, and as with the Harris Creek bridge, the construction used spans recovered from other sites. The longest span was a Schweidler truss which was recovered from the crossing of Argyle St. Moss Vale, when the Main Southern Line was duplicated in 1915. The nine plate-web-girder approach spans came from the Wollondilly River crossing near Carrick just north of Goulburn (two) and the crossings of Solitary Creek near Rydal on the Great Western Line (seven). At this location the original line crossed the Solitary Creek 17 times in a couple of miles, with six of the crossings being of iron girders (one crossing had two spans).

The Harris Creek Railway Bridge

Adjacent to the Liverpool railway bridge a timber truss road bridge of similar length allowed access to the military area prior to construction of the railway. The rest of the line was across essentially level land with few embankments, cuttings or bridges other than minor waterways such as Harris Creek.



Both road and rail bridges across the Georges River at Liverpool. Clearly there is a level crossing at the right of the picture. There were many level crossings on the 'Holdsworth' line. The train is a 'Rifleman's special' to the Anzac Rifle Range.

Photo: Ken Winney, 1943, ARHSnsw 102564.

There were more substantial embankments and cuttings closer to the end of the line, at (old) Holdsworth, and the internment camp. Within the defence area the line served the military camp itself, ordnance stores, the rifle range, and a remount depot for the loading of horses for the Light Horse Regiments.

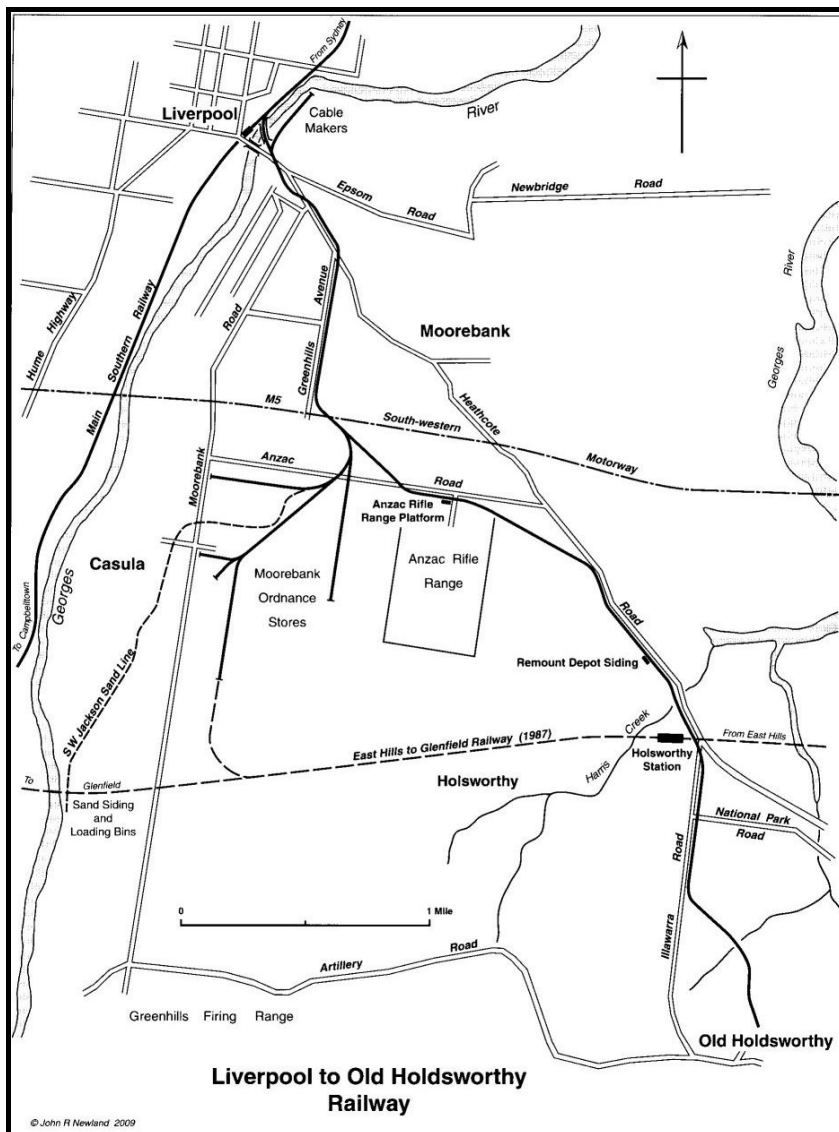


Image at Left: A plan showing the extent of the railway.

The route of the modern motorway is shown as a chain line, and the present East Hills to Glenfield railway as a dashed line.

John Newland drawing, courtesy ARHSnsw

Early in the 20th Century, the area was known as Holdsworth (with the D) though the modern station and the closely settled suburb are Holsworthy (without the D). The now accepted view is that the spelling with the D was always an error. There is a town in Devon called Holsworthy and it was there that NSW Governor Lachlan Macquarie had married Elizabeth Campbell in 1807. He had named a town, the next after Liverpool, Campbelltown, in her honour as well.

The line to the Internment Camp had a brief life as the war ended only months after its opening. Dislocation of transport and the influenza epidemic meant that the internees were not immediately deported but as soon as 1923 the only train to traverse the line was a weekly train serving the rifle range which, having unloaded its passengers, ran empty to the end of the line to run the engine around the cars before returning, still empty, to collect the riflemen for their trip home. The line to Holdsworth and the former GCC closed completely in 1930. The bridge perhaps survived as it was co-opted to carry service conduits and later as a footbridge.

The Harris Creek Railway Bridge

The rest of the line continued to be used by the military through the Second World War for ordnance and other purposes. For a time, a siding off the line was used by a private business to load sand from a quarry on the Georges River flood plain, and the Anzac Rifle Range required a weekly train until about 1960. The whole line was placed out of use, pending repairs which never happened, in 1974.



Image Above: Abandoned sidings which had once served ammunition stores, 20 years after the line closed.
Photo: John Oakes.

Image at Left: This road truck with rail wheels was used to move wagons on the sand quarry line. At the end of each shunt it was deliberately de-railled and ran as a conventional truck with steering, before re-railing for the return journey. This may thus be the original 'hi-rail' vehicle. ARHSnsw 10607.

The Internment Camp

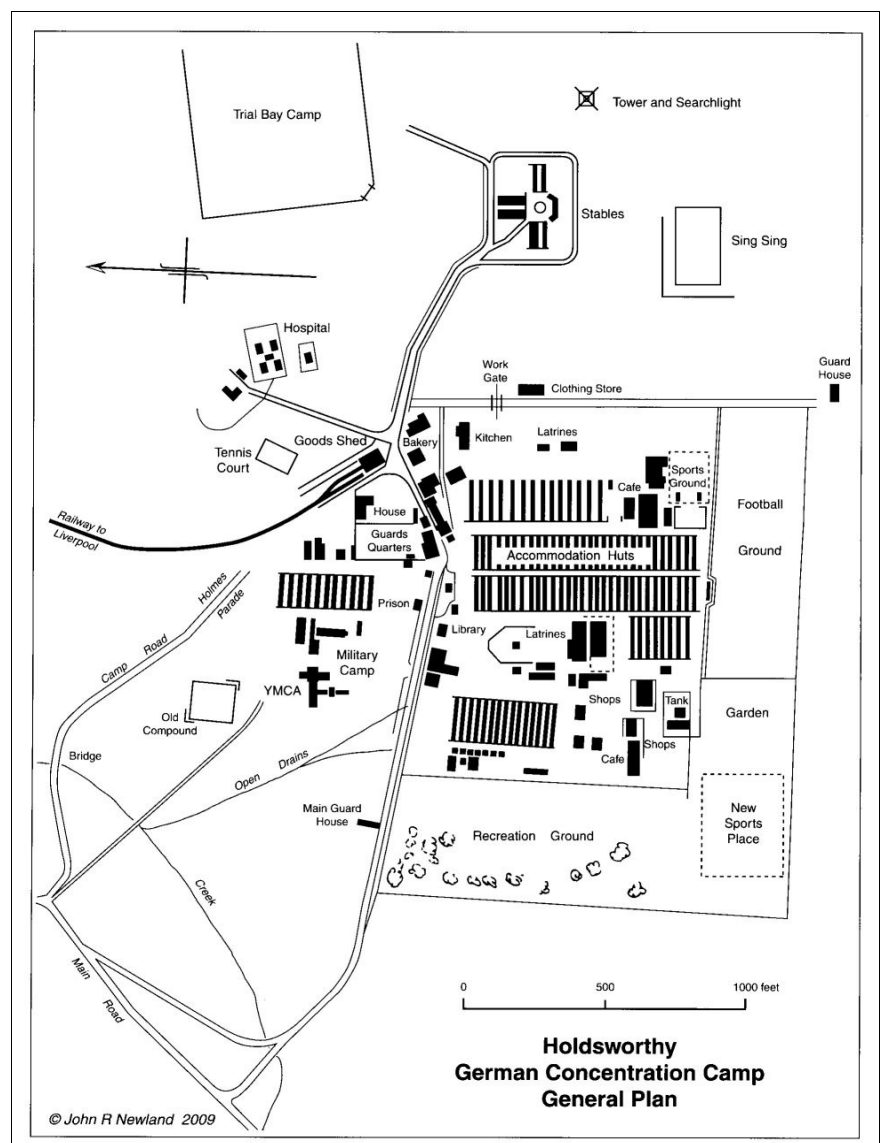
During the Great War 'enemy aliens' had to be controlled, lest they act as agents for the hostile governments. Generally, the enemy aliens were German nationals, but also included were Hungarians, Serbians, Croatians, and Austrians. Many had been residents of Australia for a long time and had Australian families, but they had foreign names and were not formally British subjects. After the war most were deported. Until this time Germans had been the largest national immigrant group in Australia, excepting the British subjects. The significance and size of the German community was reduced by the internment and deportations but remained substantial.

Image at Right:

The arrangement of the German Concentration Camp. The end of the railway – 'Old Holdsworth' – is at middle left.

John Newland drawing courtesy ARHSnsw.

Also imprisoned within the camp were genuine prisoners-of-war such as the crew of the ship *Emden*, captured after the famous battle with HMAS *Sydney* off Cocos Island in 1914.



The Harris Creek Railway Bridge

While there may have been a few inmates of the German Concentration Camp who were genuine security risks, most were not criminals and had as good a life as could be had, while restricted by the barbed wire, flood lights and machine-gun-equipped watch towers of the camp. Some ran businesses, and, of course, some were entrusted with building the railway and the Harris Creek bridge outside the boundaries of the camp.



Images at Left and Above:

Internees building the railway line to their Holdsworth camp.

Photo at left – ARHSnsw 874503

Photo Above – ARHSnsw 874508

One noteworthy inmate of the camp was Edmund Resch. He had been in Australia since 1863 at which time he was 16 years old. He built a brewing empire whose name survives today. He had generously supported the war effort and made up the pay of about sixty employees who had enlisted in the Australian Imperial Force. When he was interned in 1917 he was driven to Holdsworth by his chauffeur. Later he was allowed to serve his time in his palatial home at Darling Point – a 1918 version of ‘home quarantine’.

Accommodation was in long rows of tents though substantial buildings were erected, by the internees, for military messes and as a lock-up for recalcitrants. About 6,800 persons were interned in Australia and of these about 6,000 ended up at Holdsworth. Sandstone foundations of the Sergeants Mess and the YMCA hall survive, though bushfires have taken the buildings. The only intact building is the stone lock-up with its enclosing iron fence.



Image Above:

A view of the rows of tents in the German Concentration Camp.

Photo: ARHSnsw 874510.

Image at Left:

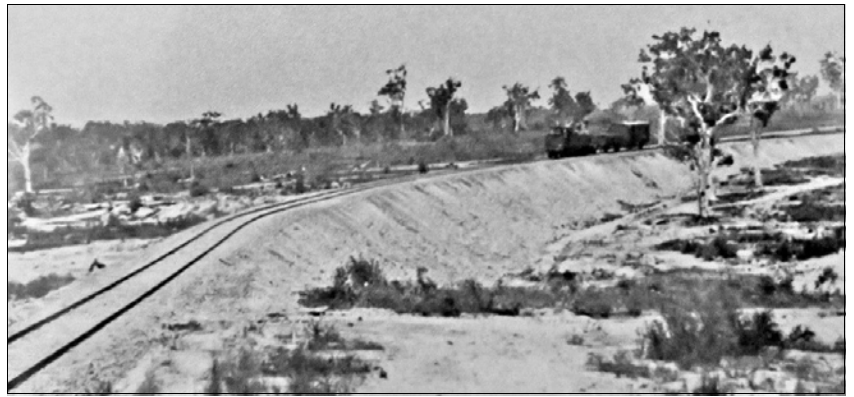
The punishment block for recalcitrant internees or prisoners. It also bears the GCC monogram on its fence pillars and the dates 1914 and 1916. It is the only intact remnant of the concentration camp.

Photo: John Oakes.

The Harris Creek Railway Bridge

In more recent times the route of the 1918 railway has been cut by the multi-lane M5 motorway, the highway from Sydney to Melbourne. In the 1980s the 1931-opened suburban railway line to East Hills was extended through the military area as a short-cut to Glenfield to the west of the camp.

Where that line crosses the old ordnance stores siding a connection was made, though from the opposite direction. There is doubt that it has ever been used except for the temporary storage of track maintenance machines between tasks.



A rare, perhaps unique, photo of a train on the Holdsworth Line, necessarily before 1930 if not earlier.
Photo: John Oakes Collection.



The new station of Holsworthy, midway between East Hills and Glenfield, serving a residential suburb of the same name, and the modern army living areas, is very close to the point where the new and old lines cross.

Image at Left:

Modern Holsworthy station. The photographer is standing near where the new line would have crossed the old line. Harris Creek crosses under the new line just beyond the station and the old bridge is beyond the picture to the right. The bridge can be reached from the station along a substantial paved walking route beside the creek.
Photo: John Oakes.

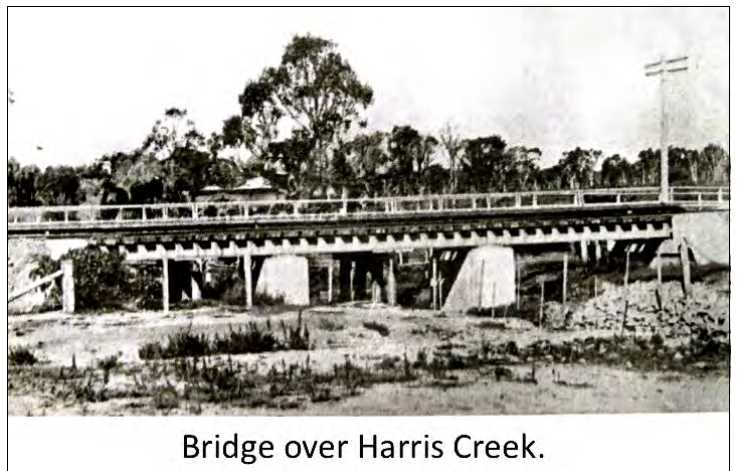
Most recently much of the former military area between the East Hills to Glenfield line and M5 Freeway has been redeveloped as a large rail to road logistics depot. With major earthworks all trace of the former military line has been lost. This

new freight yard is connected to the Sydney to Melbourne line (Southern Sydney Freight Line) by a new bridge across the Georges River at its Southern end, adjacent to the commuter line bridge. The 1918 Georges River bridge at Liverpool station was scrapped in 1979, though the mass concrete piers remain.

The area south of the East Hills line remains with the defence forces as a base and firing range. The remnants of the GCC and a few cuttings and embankments of the 1918 railway, are deep within the base. Until 1943 the dead-end access road into the area was known as Illawarra Road, but the need for a military route across southern Sydney to the Illawarra led to the urgent construction of Heathcote Road. Adjacent to this road, now a major arterial road, and seemingly destined to remain so, a simple railway bridge – Harris Creek Bridge – has a big story to tell.

Acknowledgements

This article is based on the book *Sydney's Forgotten Military Railways* by John Oakes, published by the Australian Railway Historical Society, NSW Division, 2011. The book is still in print and John's support through the provision of images from his collection is much appreciated.



Bridge over Harris Creek.

The Harris Creek bridge in earlier times, still with transoms and rails.
John Oakes collection.

Short Empire Flying Boat G-ADVB Corsair

By Margret J. Doring, F.I.E.Aust., C.P.Eng.

Introduction

This story started with my researches into my family history. Nearly 30 years ago I inherited more than 200 cardboard boxes of family papers and records – letters, cuttings, documents, photographs and books. The extended history of a family. We built a large shed with a mezzanine floor to house them all – and I have spent the last 25 years attempting to sort them into some sort of order, and scanning and digitising as much as I could. The collection is vast, and covers three generations – mine, my parents' and my grandparents'.

I have paid particular attention to the “War Letters” of my father and mother, Neville and Joan Haughton. These are destined for the Australian War Memorial, as a very rare instance of a complete two-way correspondence covering the full period of the Second World War, starting in early 1939 and finishing in November 1945. This archived (and digitised) correspondence fills twelve 4-ring binders – six each for Joan & Neville, covering all seven years of their war. There was no way I had time to read most of the letters, but occasionally, my attention was irresistibly caught, and I took time off for a coffee and a history lesson!

On one of those occasions it was a long letter which Neville wrote about his adventures in the Holy Land on a two-day leave from his regiment, encamped at Deir Suneid, in the Gaza region of Palestine, in January 1941. Neville had joined the 2/4th Field Artillery Regiment in the 7th Division of the AIF as a Lieutenant, almost from the day of its inception, and he sailed with his Regiment on RMS *Mauretania* from Port Melbourne to the Middle East via India, embarking on 20th October 1940.

Sight seeing in the Holy Land

Neville's leave started in Jerusalem, where he hired a big Plymouth car, with a driver, and, early in the morning, met up with two of his sergeants and the Regimental Padre. On Friday 10th January 1941 they all set off to the North, through Ramallah and Nablus and Nazareth and down to Tiberias on the Sea of Galilee. Neville's letter to Joan about it records:

The descent into Tiberias is fast and steep. When we passed sea level my ears felt peculiar. We lunched at the Hotel Tiberias and my sergeants and I had drinks with some English colonels. A blow to Australian insularity, eh! There was a great roaring in the sky and down came the biggest aeroplane I have seen, and landed just below us in the lake. Soon after she took off for Rose Bay - 6 days! Can you wonder that I nearly stowed away. I have a photo of her but it's not yet developed.

Some years after reading that, I came across a number of black & white negatives in a packet with the label of a Palestine photo processor. No identification on any of them – prints might have had names written on the back. Luckily I had a suitable scanner, and this lot turned out to be from that very excursion – with a portrait of the Padre, the car driver and the two sergeants on a rocky shore with, I realised later, that big aeroplane floating in the background. Next was a portrait of that big aeroplane – a flying boat with the identification G-AVDB at the rear, and, in smaller letters on the nose, the name *Corsair*.



Neville Haughton's photo of his two sergeants, the driver, & Padre Wharfe, at Tiberias on the shores of Lake Galilee, with flying boat G-ADVB Corsair moored in the background at right.
Source: Haughton Collection.



Neville's photo of the Corsair, moored in the Sea of Galilee at Tiberias, on 10th January 1941.

Source: Haughton Collection.

Short Empire Flying Boat G-ADVB Corsair

The Mail Run and the Horseshoe Route

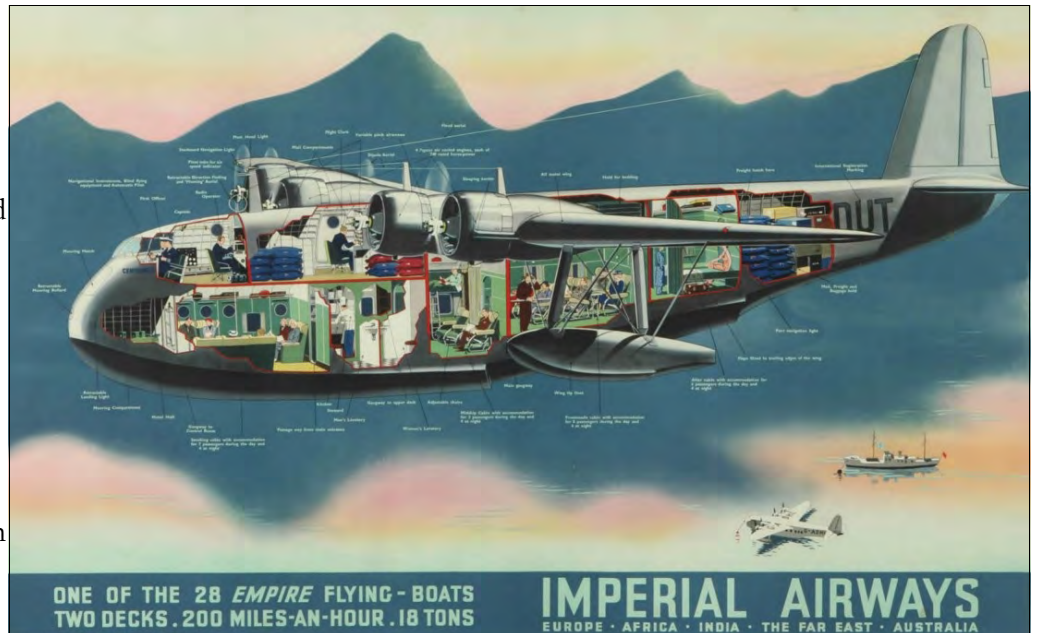
Idle curiosity I suppose, but I Googled G-ADVB and *Corsair* and came across a wealth of information – about flying boats, Rose Bay in Sydney Harbour, the extraordinary routes of the flying boats on the mail run, and the even more extraordinary history of *Corsair* herself. And by the way – something else I discovered in the course of this research – on the 10th January 1941, *Corsair* was on her way back from Rose Bay, and probably carrying letters from Joan. If Neville had stowed away that day, he would have found himself carried to Durban – even further from home than Palestine

In 1924, in the early days of aviation, a commercial British company named Imperial Airways Ltd. (not to be confused with Imperial Airlines) was started to serve British Empire routes from England to South Africa, India and Australia (including Malaya and the Far East). To start with, the planes were small, usually carrying less than 20 passengers, they were slow, and had a limited range. In 1934, Imperial Airways started negotiating with the British government to set up an airmail service over the routes Imperial Airways had established. It took some time for the *Empire Air Mail Programme* to get started – well after July 1936,

when Imperial Airways had taken delivery of their first Short Brothers designed and manufactured *Short Empire S.23 Flying Boat – C Class*. The S.23 . . . could carry 5 crew, 17 passengers, and 4,480 lb (2,035 kg) of cargo at a maximum speed of 174 knots (320 km/h) and was powered by four 920 horsepower (690 kW) Bristol Pegasus Xc radial engines.¹

The S.23 C Class Short Empires, all 31 of them, were given names beginning with C. *Short Empire Flying Boat G-ADVB Corsair* was one of those S.23s. She started service with Imperial Airways on 9th April 1937. Like all the other S.23s in the Imperial Airways fleet travelling the South African, Indian and Australian routes, *Corsair* was taken over by the British Overseas Airways Corporation (BOAC) after it was founded in November 1939, a few months after World War 2 started. The flying boats still carried passengers during WW2, but their airmail cargo rapidly became more important than the human passengers, although the passengers still had very comfortable trips.

The route taken by the Flying Boats before WW2, from England to Alexandria, as shown in the map (at right), crossed Italy with stops in Rome and Brindisi. This lasted until Germany invaded France in May 1940 and the British Army (338,000 soldiers) evacuated Northern France at Dunkirk, starting on 27th May 1940. Italy entered the war on June 10th 1940. It appears, from the map, that for a short time a detour for the flying boats around Italy – via Corsica, Tunisia, Malta and Corfu – was surmised, but any route that crossed France must have very rapidly become far too dangerous, and flights across Europe and the Mediterranean to Alexandria were abandoned altogether, and replaced by the so-called Horseshoe Route.



1937 Imperial Airways Empire Class Flying Boat advertising poster.

Source: www.tothevictoriafalls.com

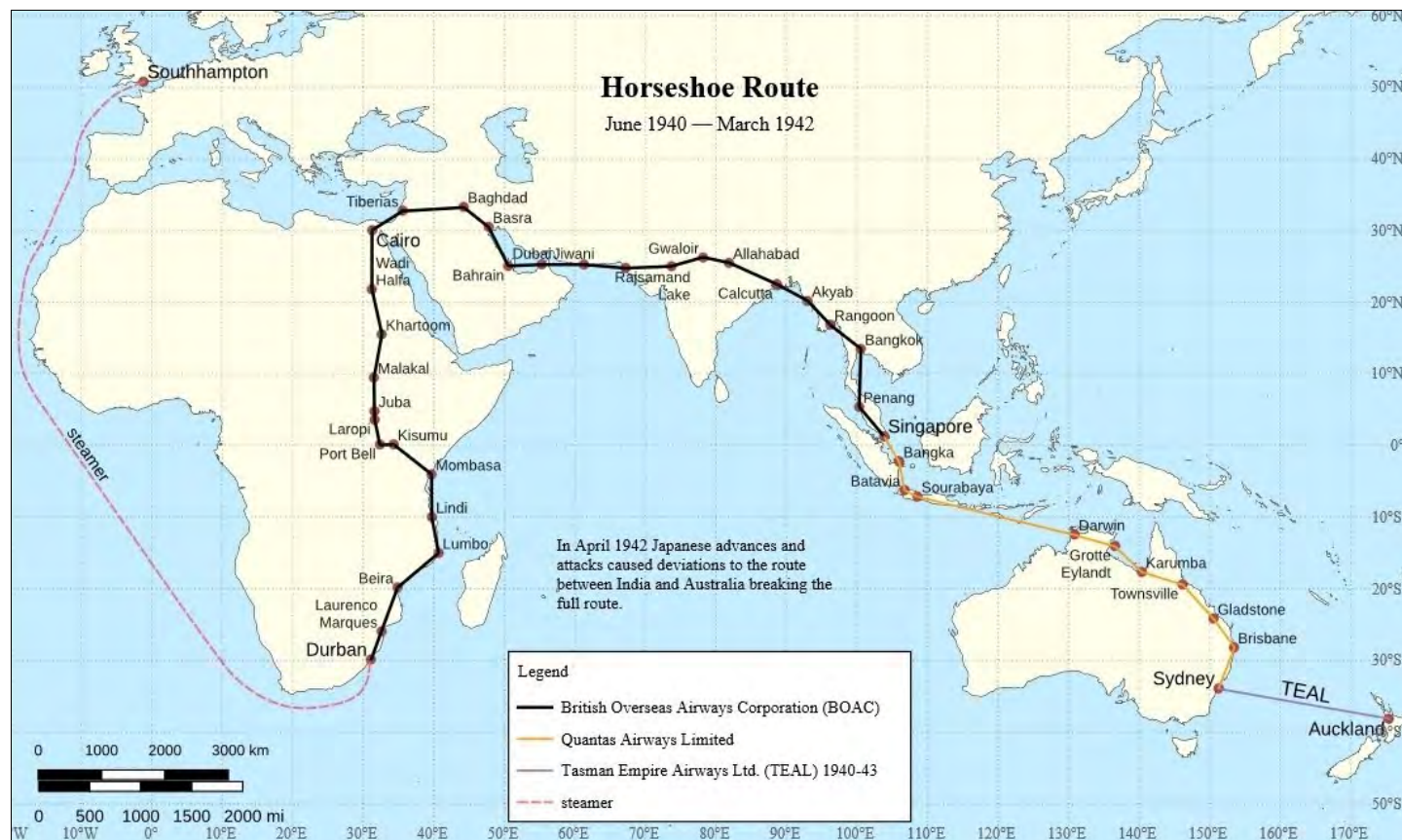


BOAC Flying Boat Routes pre-June 1940. Source: The Horseshoe Route by Robert Clark.

¹ The *Short Empire* from Wikipedia. See: https://en.wikipedia.org/wiki/Short_Empire .

Short Empire Flying Boat G-ADVB Corsair

The Horseshoe Route, in a rather fanciful reference to its shape, saw the flying boats travelling from Rose Bay in Sydney to Durban in South Africa (and vice versa), with the apex of the horseshoe in Cairo (see map below). The initial two flights both started on 19th June 1940, one from Sydney to Durban, and the other Durban to Sydney, and both finished 12 days later on 1st July 1940. I would be interested to know if the two planes passed in mid-air, or met on the ground somewhere halfway along. QANTAS Empire Airways Ltd (QEA) operated the section between Sydney and Singapore, until October 1941, when their route was extended to Karachi. BOAC at first took the Durban, Cairo, Singapore route, but retreated to Karachi during the *Battle of Britain*. Wikipedia reports that BOAC was short of pilots then. No reason is given, but I speculate that many of the BOAC pilots must have left the airline to join the RAF.



BOAC Flying Boat Horseshoe Route – Durban to Singapore, with Qantas Route to Sydney from Singapore.

Source: Wikipedia Horseshoe Route.

But why did the flying boats travel all the way down through East Africa to Durban? Because there the mails (and passengers) were offloaded onto steam ships bound for Southhampton. That first mail from the East, which landed in Durban on 1st July 1940, was carried to Capetown – probably by train – loaded onto the *Winchester Castle* on 5th July, and arrived in Southhampton on 21st July², only 16 days around West Africa, the Bay of Biscay, and up the Channel. No doubt they picked up a navy escort somewhere along the way!

From our point of view in Australia, that short (compared to colonial days), one month trip for the mails from England to Australia and vice versa, came to a halt after the Japanese attack on Pearl Harbour, on 7th December 1941, and their rapid advance down through Asia. By the end of February 1942, the Horseshoe Route had been abandoned, and the BOAC flying boats, still flying from Durban, finished their journey in Calcutta. The Japanese attack on Broome in Western Australia on 3rd March 1942, with the loss of many lives (refugees from the Dutch East Indies, local people and allied servicemen) and a number of aeroplanes, including flying boats in Roebuck Bay, brought a violent end to any easy exchange of mail and personnel between England and Australia.



Qantas Short Empire VH-ABF Cooee at Rose Bay in July 1939. She was taken over by BOAC in 1942 as G-AFBL.
Source: State Library of NSW

² Horseshoe route from Wikipedia – See https://en.wikipedia.org/wiki/Horseshoe_route

Short Empire Flying Boat G-ADVB Corsair

Letters from Home

But if we go back to the 27th of November 1940, Neville, who had just arrived at the Regiment's camp in Deir Suneid, writes to Joan: *This is the day of days – the long awaited and much discussed “mail day”. How marvellous. There are seven (7) letters for me – five from you darling and one from Mother and one from Jessie [his little sister]. . . . You make me feel now that I am so much closer to you, and indeed the mail only takes 11 or 12 days. To think that I will have news of you every week means a tremendous lot to me.* A sentiment that would have been shared by most of the Australian troops in the Middle East. Those big flying boats – comparatively low and slow flying compared to later land-based passenger aeroplanes – would have been noticed by most of the Australian soldiers in the camps they passed over, on the flight path between Tiberias and Cairo.

The first Australian soldiers (6th Division AIF) sent to Palestine for training, arrived there *early in 1940*³ – but actually, the first arrivals must have coincided with the entry of Italy into the war, in June 1940, and the initiation of the Horseshoe Route for the mails from Australia. At first the flights – both ways – were weekly, but the volume of mail grew so quickly that two months later, *from 22nd August 1940 its frequency was increased to twice a week.*⁴ The rapidity with which Australian soldiers adopted this new method of communication is quite astonishing. *The Sydney Morning Herald* of Saturday the 8th of March 1941 recorded, for the information of the families at home:

A.I.F. ABROAD USES THE AIRMAIL. 90,000 Letters Last Month.

The Australian forces in Palestine and Egypt sent more than 90,000 airmail letters to Sydney in February; and since February 18, 6,000 air mail letters, in [?] lots, have reached Sydney from Libya [North Africa].

Those planes flying overhead – and landing in the Sea of Galilee – made a deep impression in the minds of more soldiers than just Neville. One of those soldiers wrote a wonderful poem titled *AIR MAIL – PALESTINE*, which was published in *The Sydney Morning Herald* on 16th August 1941, probably some months after it was written.

The poet was David McNicoll, a journalist with the *Sydney Morning Herald* who, together with 4 other friends from the *Herald*, *joined in ... a thing called the 2nd Armoured Regiment which was a CMF unit. And then when things looked very nasty over in the UK and they were setting up the 7th Division the five of us all volunteered together and went in as private soldiers - as troopers.*⁵ He doesn't mention the unit they were transferred to, but it is recorded in the Nominal Rolls as 7 DIV CAV REGT, which was formed in April 1940, and sent to the Middle East in December 1940. About a year later, McNicoll was commissioned Lieutenant and attached to the Military History & Information Section Headquarters in the Middle East

I came across a newspaper cutting of *AIR MAIL – PALESTINE* somewhere among Neville's letters in a jumble of bits and pieces that had lost their original location. He has written on it, in red Biro, in the 1970s I think, *in N letter Jan'41*. This cutting probably came from one of the many newspapers around Australia which republished the poem. The date probably refers to his own encounter with *Corsair* at Tiberias. The copy I have reproduced (on the next page), is transcribed as it appeared in the *Sydney Morning Herald* original.



Lt David McNicoll. Photo Australian War Memorial



Here is G-ADVB *Corsair* alighting on the Sea of Galilee in c1938 (from a US Library of Congress photo). I like to think it was *Corsair* that McNicoll saw, heading to Galilee on an unknown day in 1941.

3 6th Division (Australia) from Wikipedia – See [https://en.wikipedia.org/wiki/6th_Division_\(Australia\)](https://en.wikipedia.org/wiki/6th_Division_(Australia))

4 Horseshoe route from Wikipedia – See https://en.wikipedia.org/wiki/Horseshoe_route

5 David McNicoll, in an interview with Tim Bowden for the Australian War Memorial in December 1989.

See: <https://s3-ap-southeast-2.amazonaws.com/awm-media/collection/S00745/ocument/1044015.PDF>

Short Empire Flying Boat G-ADVB Corsair

AIR MAIL – PALESTINE

by David McNicoll

“Praise God from whom all blessings flow”,
The padre said; and row on row
The rustling hymn books in the sun,
Flickered, were folded. Then as one
A thousand voices stirred the air —
Were silent. Heads were bent in prayer.

* * *

Above the padre’s voice we heard
An engine drone; then like a bird
With silvered wings, we saw the plane
Above the sandhills, out to sea
Heading, with mail, to Galilee.
And in the clouds we saw again
Our homes; the noon day simmering sun
On farm, and beach, and station run;
The stock knee-high in summer grass,
The shearers nodding as we pass
Each stand; the silos crammed with wheat.
The sheep dogs panting in the heat;
The breaker’s curl, the lash of foam —
The aching, taunting thoughts of home

* * *

“Praise God from whom . . .” and each man bends
His head, to thank his God who sends
Halfway across the world, the mail:
Who deems those engines shall not fail,
But that they bring across the sea
The mail, to his own Galilee.

The Short Empire C Class S.23 Flying Boats

Those flying boats, that meant so much to our soldiers so far from home in the Middle East, were superb machines – unrivalled for their time in *speed with spacious comfort – an Imperial flying-boat*.⁶ They were manufactured by the firm of Short Brothers, in the No.3 Erecting Shop at their Seaplane Works in Rochester on the River Medway, in Kent, south of the River Thames, and only a few miles from the famous Chatham Dockyards.



Image at Left: An aerial view of the Short Brothers No.3 Erecting Shop and its slipway into the Medway River, taken from the west.

Source: Short Bros. photo No.75675, from *Flying Empires*, a book by Brian Cassidy.

The S.23s *were designed and constructed in response to the Imperial Airways Limited “Outline specification for a 4-engined flying boat”, . . . issued sometime after January 1934*.⁷ The very first S.23 to be rolled out onto the slipway at the Seaplane Works was G-ADHL (later named *Canopus*). She emerged from the Erecting Shop on the 1st July 1936.

⁶ See: https://www.antikbar.co.uk/original_vintage_posters/travel_posters/qantas_empire_airways_imperial_airways_flying_boat/PT3626/

⁷ From *Flying Empires* by Brian Cassidy – see: <https://www.seawings.co.uk/images/EmpireProfilebookgal/Flying%20Empires%20Book.pdf>

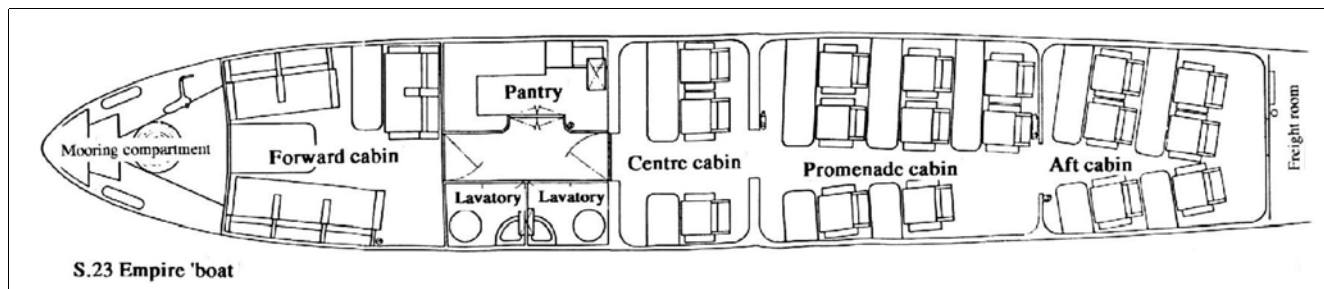
Short Empire Flying Boat G-ADVB Corsair

The S.23s were right up with the latest technologies of their time, with high strength and durable aluminium alloys used in frame and skin – most planes built before the 1930s had light-weight timber frames and skins of timber sheeted in fabric, or just fabric stretched over the frame. Earlier planes were much smaller and fragile in comparison to the S.23s. The S.23s were monoplanes, 88 feet in length, with a wingspan of 114 feet and a maximum height of almost 32 feet. They had four Bristol engines. Their maximum speed was 200 mph with a cruising speed of 165 mph. *The flightdeck was relatively well equipped for the era, including features such as an autopilot; . . .*⁸ Some other gear mentioned in this Wikipedia list included a compass, a variometer, an artificial horizon, altimeter, a Marconi-built radio direction finder, chronometer, and Marconi-built shock-proof radio sets for receiving and transmitting – eat your heart out Kingsford Smith!



The first Short Empire to be built – G-ADHL, later named Canopus – on the No.3 Erecting Shop slipway into the Medway River on 1st July 1936.

Source: Short Bros. photo No.H902(d), from *Flying Empires*, a book by Brian Cassidy.



S.23 Short Empire flying boat – showing the floor plan of the lower deck.

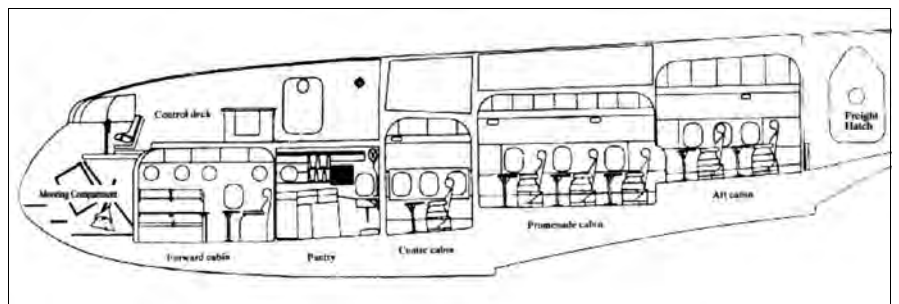
Drawing from Cassidy, Brian, *Flying Empires*.

The two drawings (above and right) can be compared with the cut-away view of the flying boat in the advertisement shown on a previous page of this story.

Generally, the S.23 crew of 5 consisted of 2 pilots, navigator, flight clerk and steward, who looked after 24 seated daytime passengers – or 16 sleeping passengers in bunks for overnight flights.

They could carry 2 tons of mail. I guess the flight clerk must have loaded, sorted and unloaded the mail, because the steward would have been flat out the whole time taking care of the passengers. Those passengers had a pretty luxurious trip. The fares were very expensive – passengers were usually businessmen, or government officials, or the very rich. A typical dinner menu presented to the passengers on G-ADVB *Corsair* (date unknown, but probably pre-WW2 – and not including the wine list!) was:

Pate de Fois Gras or Grapefruit
Roast Chicken, Ox Tongue, York Ham
Russian Salad
Peaches Melba, Golden Figs
Cheese - Cheshire, Camembert, Kraft
Toast Imperial, Assorted biscuits, Coffee.



S.23 Short Empire flying boat – showing a section through the upper and lower decks.
Drawing from Cassidy, Brian, *Flying Empires*.

⁸ Short Empire Flying Boats C Class from Wikipedia – see: https://en.wikipedia.org/wiki/Short_Empire

Short Empire Flying Boat G-ADVB Corsair

Short Empire Flying Boat G-ADVB Corsair

And that glimpse of high life in the air takes me back to the original inspiration for this story – the *Corsair*, afloat on the Sea of Galilee at Tiberias. G-ADVB *Corsair* was the 11th of the 31 Short Empire S.23s to be built. She emerged from Short Bros. Rochester Erecting Shop onto the slipway and was launched on 3rd April 1937.

Her delivery flight to Hythe, in Hampshire near Southampton happened only 5 days later. Hythe was the location of an Imperial Airways (and later BOAC) flying boat maintenance base. It was convenient for flights from Southampton Water. Passengers were picked up by motor boat from a berth at Southampton Docks, and ferried across to the waiting flying boats 2 miles away.

Corsair joined the fleet immediately, and the very next day was off on her maiden service with Imperial Airways – to Alexandria in Egypt and back to Hythe a couple of days later. It was not long before she was regularly doing the long trip down through equatorial Africa to Kisumu and Durban and back again to Hythe, or later, to Southampton, where passengers were later able to embark directly from one of the Southampton docks.



Corsair on the runway outside Short Bros. No.3 Erecting Shop on the same day she was launched – 3rd April 1937. Source: Paul Sheehan



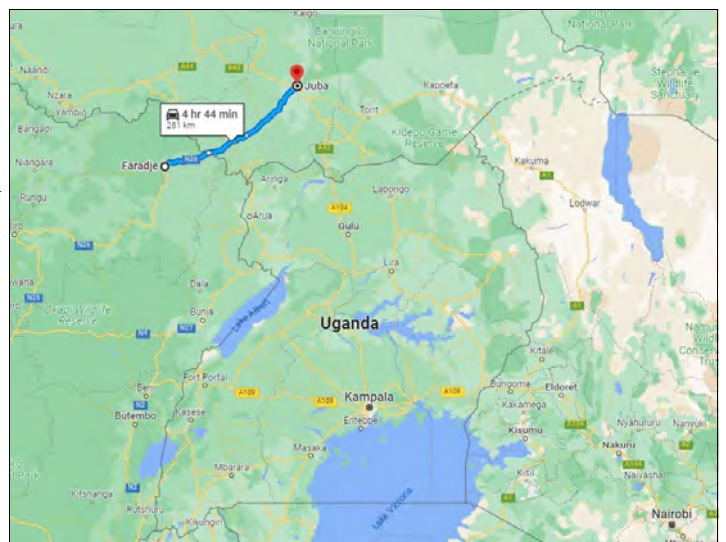
ADVB Corsair crashed at Faradge

This rather fuzzy photo came from a website <https://whitewaterlandings.co.uk/>

From a map, it appears that the spot where *Corsair* landed in the Dungu River must have been close to the village of Faradge, because the passengers and crew and their baggage, and the all-important mail, were soon rescued by the Belgian Resident Officer, and driven north to the town of Aba, near the border with the South Sudan, and then on to Juba, a city further north in South Sudan, on the White Nile. No doubt the G-ADVB *Centurion*, which carried all the *Corsair* people and luggage on to their next destination, had no trouble alighting and taking off from the much bigger White Nile.

Image at Right: A Google Map showing Kisumu on Lake Victoria in Kenya, Faradge in the Republic of Congo near the Dungu River, & Juba in South Sudan on the White Nile. The map scale is too small to show the rivers.

Occasionally, *Corsair* did a trip on the England to Australia route – from Alexandria as far as Karachi – then part of India. In early 1938 she went a few steps further – to Singapore, but her first visit to Rose Bay in Sydney didn't happen until August 1938. She did visit Sydney several more times in 1938 and early 1939, but then disaster struck – not on the way to Sydney, but on the Dungu River near Faradge (or Faradge) in the (then) Belgian Congo. *Corsair* was on her way home from Kisumu on Lake Victoria in Kenya, on the 14th March 1939, when she had to make a forced landing in the said river. Unfortunately the river was very shallow in that section, and *Corsair's* hull and the port wing float were badly holed by some rocks she encountered when taxiing after alighting, and she settled onto the river bed amid the rocks and mud.



Short Empire Flying Boat G-ADVB Corsair

Meanwhile, a salvage effort aimed at getting *Corsair* into the air was instituted back in the UK. From this distance in time and the subsequent advances in technology, it's hard to imagine the enormous complications in planning and carrying out the repairs in such a remote tropical place. Recovery teams from Short Brothers and Imperial Airways had to be organised and transported from England, along with the tools and materials they would need, and probably camping gear, suitable clothing, even medications. The logistics are frightening even today, but in only four months the repairs were all completed and *Corsair* was considered ready to take off.

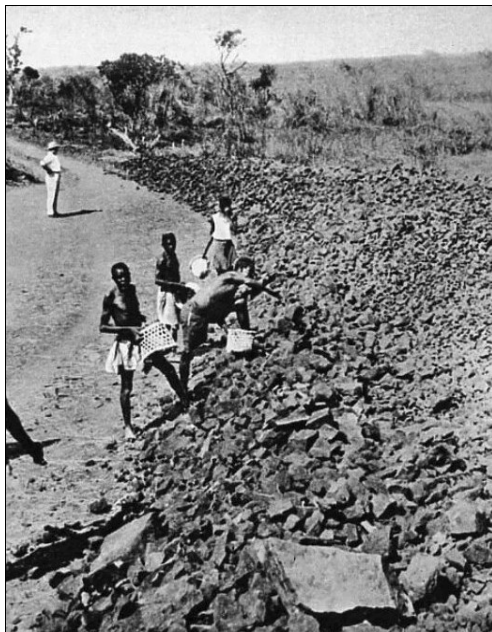
On the 14th July 1939, two previous members of *Corsair*'s crew – Captain E.J. Alcock, and First Officer W.L. Garner, with one other crew member, were ready to give it a go. The river was still low, and *Corsair* had to be steered between markers – presumably strung along both sides of the river – to avoid the many big rocks. As *Corsair* was opened up to full power, her nose started to rise, so Captain Alcock could no longer see the markers. She went off course and collided with a rock near the bank, ripping a hole in her planing bottom, stopped there, and then slid backwards into the river.



G-ADVB Corsair in the Dungu River near Faradge. She appears to be afloat, and this undated photo could have been taken after she had been repaired the first time, and before 14th July 1939, when Capt. Alcock attempted a take-off.
Source: Paul Sheehan.

One can imagine the frustration and disappointment in everyone who had tried so hard to get *Corsair* back in the air. There must have been much discussion as to whether they should try again, or just abandon her, and it was about two months before a survey team was sent out by Imperial Airways to assess the damage and the feasibility of repair. I can imagine this must have generated much discussion about the state of the River, and

whether it was likely to be high enough for *Corsair* to take off when she was patched and floating again. Amazingly, the answer they came to was to dam the river. A number of experiments with another S.23 in Southampton Water showed that *Corsair* should be able to take off within a length of 125 yards (114m), and it was thought possible to raise the water level enough for a safe take-off.



Collecting rocks in baskets for the dam building.
Source: From the internet - photographer unknown.

While the recovery teams worked on the repair of *Corsair* – patching the new tear in the planing bottom in the water, floating her, and then dragging her up onto a beach and finishing the repairs on dry land – the locals worked on building a dam, downstream a bit. I found no descriptions of the dam building, but did find two photographs which speak vividly of the work. One (left) shows local men collecting rocks for the dam in baskets, with a stout supervisor standing in the background. The other photo (next page) shows the actual dam under construction – all by hand. It looks very primitive, but it worked! There must have been huge sighs of relief when *Corsair* took off, flown by Captain J.C. Kelly-Rogers, First Officer Garner and Radio Officer Dangerfield, in the early morning of the 6th January 1940, and took a short flight to Juba, where they could no doubt relax when alighting on the White Nile.

Short Empire Flying Boat G-ADVB Corsair



Dam building on the Dungu River to raise the river level so Corsair could escape.
Source: From the internet - photographer unknown.

Corsair was then flown on to Alexandria, where she underwent a three day check-over before a flight back to Hythe for a more substantial overhaul, and thorough examination of the repairs done under such terrible conditions in the wilds of Africa! Two months later she returned to the mail run, on the Sydney leg this time, and then back to Durban in May 1940. She did one more cycle from the Imperial Airways new base at Poole (was Southampton becoming too dangerous?) to Durban before Italy entered the War, and the Mediterranean route back to England was suddenly cut, on the 10th June 1940. *Corsair* was in Durban at the time, and she was swiftly transferred from Poole base to the Durban base of what had very recently become the airline BOAC.

Corsair remained connected to the Durban flying boat base until the end of the War. She had started service from Durban on the newly designated Horseshoe Route at the end of June 1940, flying back and forth between Durban and Karachi, and further on to Sydney. She deviated from the routine once – on charter to the RAF, carrying urgently needed fuel supplies from Singapore to the Dutch East Indies (as it was then) soon after Japan had entered the War by attacking Pearl Harbour on 7th December 1941. *Corsair's* last trip to Sydney ended on the 25th December 1941, when she flew out, heading for Karachi. The field of war in Asia changed very quickly after that. Flying across Burma and Thailand and down the Malay Peninsula to Singapore and beyond was getting very dangerous, and when the Japanese invaded Singapore in February 1942, the whole eastern leg of the Horseshoe Route was abruptly cut short at Calcutta.

Corsair continued carrying mail and passengers between Durban and Calcutta – but no further – for more than a year after the War in the Pacific ended on 2nd September 1945. Her last commercial service for BOAC was from Cairo to Durban, finishing that flight on 7th January 1947. Just over a week later she flew home to England – to the BOAC flying boat maintenance base across Southampton Water from the Port of Southampton. She hadn't been back to Hythe, or England, since early June 1940 – nearly 7 years away from home. After an almost faultless service life of 13,262 hours and nearly 10 years in time, you would think she might have been greeted with honours and celebrations on her return. But no! Like all of the other Short Empires that survived after the end of the War (except for two scrapped in Sydney and Auckland), *Corsair* would have been unceremoniously hauled up into a hangar, broken up into pieces of scrap, and the pieces sold for whatever scrap value they were worth!

This total and shameful destruction of these important items of our engineering and wartime heritage was apparently carried out without question or protest from anyone in aviation circles, or anyone who might have had an interest in preserving at least one of them for posterity. One would think the Imperial War Museum might have been interested in keeping just one. But no again! Those flying boats were commercial, and had nothing to do with war? Excuse me! What have I just been writing about? With the development of bigger and faster land based planes, with greatly extended ranges, flying boats had become unfashionable. No-one gave a . . . about their passing. As an engineering and architectural heritage consultant and industrial archaeologist of 40 years standing, I am ashamed for my engineering forebears, but I am pleased to have discovered so many enthusiasts who are now trying to resuscitate the memories of those fabulous Flying Boats.

Acknowledgements: Apart from the information in my own family records, much material in this story came from the Internet. Further, I am very grateful for the wonderful help, and clues in searching, I received from two people in Australia – Phil Vabre, Vice-President of the Civil Aviation Historical Society (CAHS) and Paul Sheehan, who I think is also a member of CAHS. They brought this story of the Flying Empires and *Corsair* alive for me!



Corsair on the Lake at Gwalior, India
Source: IWM - CH15322.
an undated photo from the Imperial War Museum, London.

Catalina PBY Flying Boats

From the Editor

On reading the previous story, my friend Keith Baker reminded me that there were other Flying Boats carrying mail and passengers from and to Australia in the 1940s. Those were the PBY Catalinas which were used by Qantas for some years on the “Double Sunrise” flights, non-stop between Perth and Colombo – 6,652 km.¹ The Catalinas were built as warplanes, used for flying mine laying, bombing, and maritime patrols. They were even known to have engaged with enemy planes. Their commercial use was very much limited by their size – on the “Double Sunrise” flights they were limited to three passengers and 143 pounds of mail!

The Catalinas saw WW2 service in many theatres, with the US Navy and Army, the Canadian air forces, the RAF and the RAAF. Several thousand of them were built in the USA, 620 in Canada, and even 27 were built by the Soviet Union.² Unlike the always exceedingly rare (and now non-existent) Flying Empires, quite a large number survived WW2, some continuing in the military until the 1980s, and some still in civilian employment (most as water bombers) until very recent years. It’s therefore not surprising to find a number of museums with a Catalina in their collections.

Keith drew my attention to one in Victoria – at the Lake Boga Flying Boat Museum,³ home of WW2 RAAF No.1 Flying Boat Repair Depot, on the shores of Lake Boga, between Kerang and Swan Hill in northern Victoria. This Catalina A24-30 had a chequered history – adopted by the RAAF in 1942, and sold for spare parts after the war. The body was sold for scrap, but it survived until the 1980s, when it was given to the Lake Boga Lions Club. Members of the Club have re-assembled the Catalina, and partially restored her, and since 2012 she has been on display in a specially built hangar on the Museum site.



The Lake Boga Catalina in the park at Lake Boga in 2009. Photo: Mattinbgn.

But Catalina A24-30 is not the only one in an Australian Museum. A particularly famous specimen – Sir Patrick Gordon Taylor’s Catalina, *Frigate Bird II*, is hanging from the roof of the former Boiler House at the Sydney Museum of Applied Arts & Sciences. Its history is recorded in <https://collection.maas.museum/object/207900>



Frigate Bird II over Sydney.
Undated photo from MAAS Collection.

Down on the east coast of NSW, near Wollongong, at Albion Park Rail, is the Historical Aircraft Restoration Society (HARS) Museum, which has another Catalina on display. This one has an interesting history, including sinking in a lake in Argentina, being salvaged and rebuilt and back in service. She was acquired by HARS in Portugal and in 2003 made a three week flight to Australia, landing (she is an amphibian) at an airport near the Museum.⁴ I think she deserves a name of her own! See her at:

<https://hars.org.au/consolidated-pby-6a-catalina/>

And last, that I know about, a (sort of) surviving Catalina which is not in a museum – yet! It seems very many years ago now – in 1992 – that my partner Carl Doring and I were engaged to carry out a Heritage Study of the City of Lake Macquarie in NSW near Newcastle. One of the more significant ‘suburbs’ around the Lake shores that we documented was Rathmines Park – *once the largest RAAF Flying Boat Base in the Southern Hemisphere*.⁵ *The Base is the only surviving and intact Flying Boat base left in Australia, and it is significant that it has been recognised for protection on the State Heritage Register*.⁶ We recorded its significance, but privately, I regretted that it didn’t have even one example of a flying boat on display in the Park, or on the water. Many years later, the Rathmines Catalina Association started a worldwide search for a suitable ‘boat’. They found one in Puerto Rico, imported it to Rathmines in 2013, and started restoration work with a view to putting it on display in the recently established museum. That still hasn’t happened, but they live in hope.⁷

1 For the Double Sunrise flights, see: https://en.wikipedia.org/wiki/Consolidated_PBY_Catalina

2 Consolidated PBY Catalina in Wikipedia - see: https://en.wikipedia.org/wiki/Consolidated_PBY_Catalina

3 Lake Boga Flying Boat Museum see: <https://www.lakebogaflyingboat.com/>

4 Find out more about the HARS Catalina at: <https://hars.org.au/consolidated-pby-6a-catalina/>

5 Find out more about Rathmines Base at: https://en.wikipedia.org/wiki/RAAF_Base_Rathmines

6 History of Rathmines Base at: <https://rathmines-catalina.com/RAAF-Base>

7 See the Newcastle Herald of 13/12/2022: <https://rathmines-catalina.com/Our-Girl-move-to-Beresfield>

The Walter Taylor Suspension Bridge

Indooroopilly, Brisbane.

By Brian Beconsall, FIEAust, EHQ.

One-of-A-Kind Suspension Bridge

The Walter Taylor Bridge, which crosses the Brisbane River between Indooroopilly and Chelmer, suburbs of Brisbane, is a unique variation of the rare Florianopolis/Steinman suspension bridge design. With a length between pylons of 600 feet (183 metres), the Walter Taylor Bridge was the longest suspension bridge in Australia when completed in 1936 and remains a celebrated Brisbane heritage icon.



Side elevation sketch of the Walter Taylor Bridge, from Brisbane City Council (BCC) Archives.

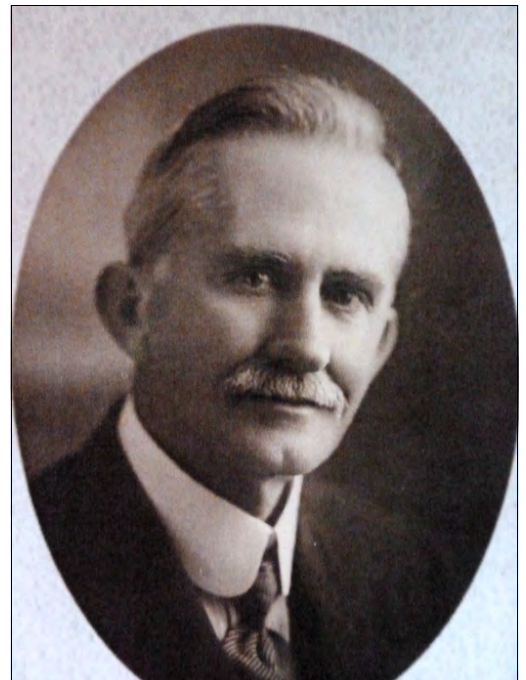
Who was Walter Taylor?

Walter Taylor was born in Sheffield England in 1872 to Walter and Ann Taylor, the father Walter being a joiner. The family emigrated to Australia in 1884 and Walter senior established a contracting building business and later Walter junior and his brother Ernest joined him to learn the construction industry on the job.

Walter Taylor junior married Louisa Braun in 1900 and, to further his knowledge and expertise, he moved his family to England in 1902. With a flair for invention and new construction techniques, he spent 10 years in the construction industry to gain more experience, particularly in the new and developing field of reinforced concrete.

From 1912, back in Australia, he spent the rest of his life developing a successful construction business in Brisbane and surrounding regions. Specialising in reinforced concrete structures, Walter Taylor developed many projects including bridges, warehouses, apartment blocks, factories, schools, hospitals, and churches. Although he lacked formal engineering training, he was astute enough to recognise the need to always have engineering designs completed with qualified engineers, and developed good working relations with leading architectural firms of the day.

In 1955, Walter Taylor died at the age of 93, and while his legacy of buildings is still seen around Brisbane, his suspension bridge at Indooroopilly is by far his greatest achievement.



Portrait of Walter Taylor from the BCC Archives.



Church Buildings

He built the Sherwood Methodist Church and did major renovations to the Wesley Church at Kangaroo Point, and the Presbyterian Church at Wickham Terrace. He was a devout Methodist, a lay preacher, and a Senior Circuit Steward. Living in Graceville, he became a major benefactor of the Graceville Uniting Church. The current church, built by him in 1930 in Oxley Rd Graceville is a fine example of *perpendicular gothic*, in which he uses his precast concrete methods to bring cathedrals to the suburbs. This church is listed on the Queensland Heritage Register and by the Australian Heritage Commission.

Image (at Left): Graceville Uniting Church in 2021. Photo from the Church's website.

The Walter Taylor Suspension Bridge

Early Bridges

Taylor built the Boyne River Bridge at Mundubbera, the Barambah Creek Bridge at Gayndah, and the Downfall Creek Bridge at Gympie Road. His first concrete bridge, which is still in use, was the Abbotsford Road bridge over Breakfast Creek, Albion, which at that time was the longest of its type attempted in Brisbane. The total length over abutments is 208ft, and total width 68ft, with three spans each 50ft.



Abbotsford Road bridge over Breakfast Creek, Albion, designed & built by Walter Taylor for the BCC. It was opened in 1928.
Photo - Wikimedia Commons.



Public Buildings

Over the period from 1920 to 1936, Taylor was busy with a number of large buildings in Brisbane. This was during the time the Walter Taylor suspension bridge was also under construction. The buildings included the F. Tritton Building in George St, Invicta House and Hoey & Fry Pioneer House in Edward St, Gordon & Gotch Building, major high school extensions to Sommerville House and the Church of England Grammar School. Possibly his most prominent building is the Craigston Apartments in the medical precinct at Wickham Tce, Spring Hill in the city, built in 1928 and added to the Queensland Heritage Register in 1992. This 8 storey Spanish Mission style building was the first reinforced concrete multi-storey building in Brisbane and remains a classic highly valued inner-city residence.

Image (at Left): The Craigston Apartments in Wickham Terrace, Spring Hill, Brisbane.

Photo: 2021, by Vic Bushing.

Private Homes

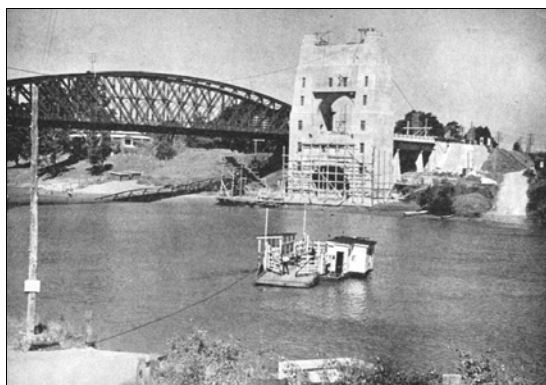
Although not his preferred construction, he built several homes from the 1920s to the 1950s for his family, staff and friends using a unique reinforced cast concrete block system that he had developed. These concrete block buildings were carefully styled using rounded corners, hexagonal features and ornate uprights embellishing the porches. At least seven of these are still standing in the Graceville-Chelmer area.



Glenrae, the concrete block & timber home built in 1928 by Walter Taylor for his own family. Image: Qld Heritage Council.

The need for a second Brisbane River bridge

During the 1880s, the lack of a nearby road bridge led to frustrated residents lobbying the colonial government to link vehicle access from Indooroopilly to Chelmer. Their deputations were unsuccessful at this time, leaving the Victoria Bridge in the City as the only road crossing available to vehicles needing to travel over the Brisbane River.



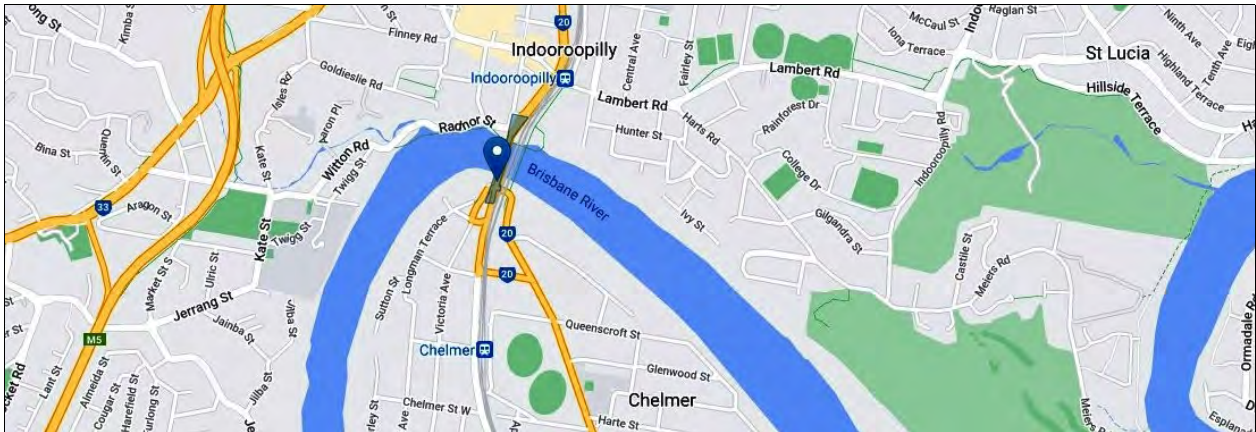
Living and working from Graceville from the 1920s Taylor was acutely aware of the need for another vehicle bridge crossing. In 1924, the Sherwood Progress Association, chaired by Taylor, produced a proposal for a bridge to mark the centenary of Lieutenant John Oxley's first visit to Brisbane in 1824. This would allow the old 1892 vehicular ferry used at this point to finally be replaced. Various progress associations and shire councils then came together, forming the Indooroopilly-Chelmer Centenary Memorial Bridge League.

Image (at Left): The tiny vehicular ferry in 1935, still operating while the Walter Taylor Suspension Bridge was under construction.

Photo: BCC Archives.

The Walter Taylor Suspension Bridge

Representations for a new vehicle bridge were then made to the Brisbane River Crossing Commission, which had been appointed by the Brisbane City Council and chaired by Professor Roger Hawken of the University of Queensland engineering faculty, to investigate options for future river crossings.



MAP - Shows the route chosen across the Brisbane River for the Walter Taylor Bridge, from Indooroopilly (north) to Chelmer (south)
Copied from the Qld Heritage website.

Further traction from the 1930s great depression sparked the need for large public and private works to be implemented to provide economic stimulus. The then Moore Ministry of the Queensland Government passed measures to allow franchises to be granted to private enterprise, to build and operate public projects.

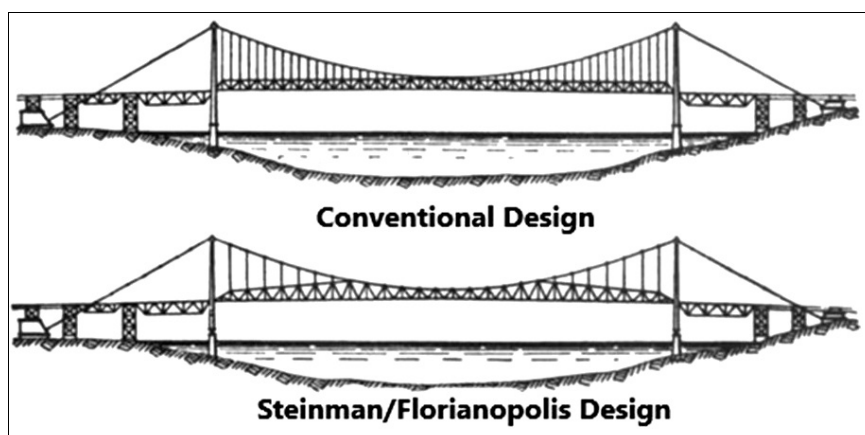
In 1931, with support from the newly established Brisbane City Council, an agreement was made with the Queensland Government for a franchise to Walter Taylor for a road suspension bridge. Walter Taylor then assigned his franchise to the *Indooroopilly Toll Bridge Limited* private company, which raised £75,000 in capital, divided into 7,500 shares at £10 each, a formidable task during a great depression. Walter Taylor was both a director, project manager and constructor. However, all designs and plans were subject to approval by the Main Roads Commission.

Design of the Walter Taylor Bridge

The design adopted applied a technique invented by the celebrated American civil engineer D.B. Steinman, who built the first bridge of this type in 1926 in the town of Florianopolis, in southern Brazil. This style is now referred to as a Florianopolis bridge. This new design differentiated from conventional suspension design by raising the top member of the bottom stiffening truss to join the catenary at the quarter points of the span. This had the effect of cancelling out some of the opposing forces, enabling cost savings in material.



1926 Ponte Hercilio Luz, Florianopolis, Santa Catarina, Brazil.
Photo: Beto Quissak 2014 - Wikimedia Commons.



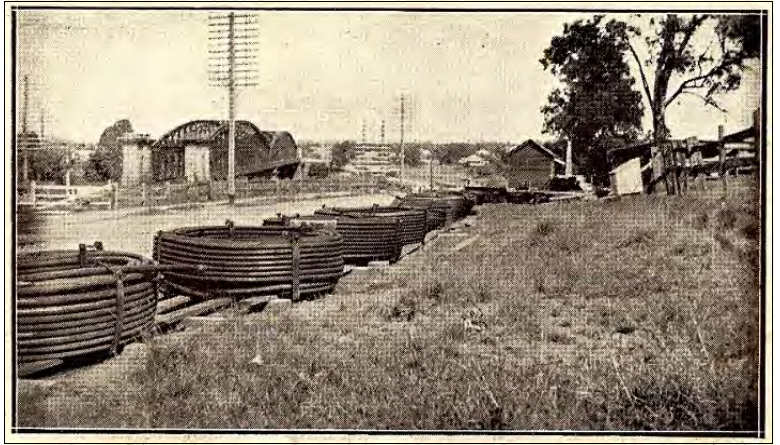
To build using this Steinman design, Taylor replaced the normally used steel eye bars linked as chains for the suspension, with surplus steel cables left over from the recent construction of the Sydney Harbour Bridge.

Image (at Left): Sketches showing the concept of the design by Steinman. Drawing adapted from "Engineers of Dreams: Great Bridge Builders and the Spanning of America", by Henry Petroski (1996).

The Walter Taylor Suspension Bridge

Early in 1931, Taylor had become aware of the availability of these surplus steel cables. Seeing a great opportunity to save costs, he secured a purchase agreement from Dorman Long and Co. in Sydney for two groups of 12 cables, with each cable 2.76 inches (70 mm) in diameter and 1060 ft long (323m). Each cable contained 217 cores of 8 gauge wire (being 0.160 inch, or 4 mm in diameter) wound in eight layers.

Image (at Right): The Sydney Harbour Bridge cables stacked ready for use, on the Taylor bridge approaches, Image: BCC Archives.



The total breaking load for each Sydney Bridge cable is 350 tons, and in the design for Indooroopilly, these operate at a maximum load of only 84 tons each. To achieve this, Taylor had to develop special bolted steel plate joints to connect the suspension cables to the steel channels connecting the bottom stiffening truss. These were successfully tested by Professor R. Hawken at the University of Queensland Faculty of Engineering. The combination of these two innovations has resulted in a unique variation of design, truly one of a kind.

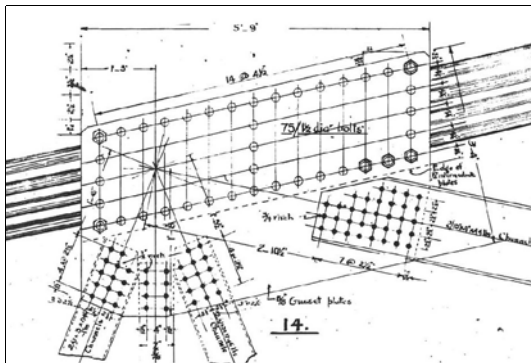


Image (at Left):
A project drawing from the BCC Archives showing Joint 14 – construction as described above:

Image (at Right):
Joint 14 Plates being bolted together in 1935. Photo: BCC Archives

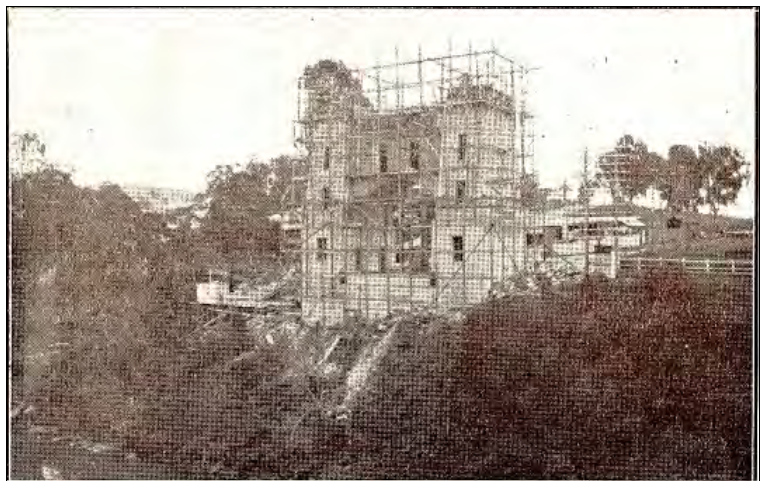


Throughout all the design processes, Taylor engaged with several consulting engineers to resolve all technical aspects to the satisfaction of the Brisbane City Engineer, E.F. Gilchrist, and the Main Roads Commissioner John R. Kemp in accordance with the terms of the franchise. Although their involvement was never fully recognized at the time, it is now widely acknowledged that the detailed bridge design was completed by Walter J. Doak, Chief Engineer, Queensland Rail. Designs of the pylons of reinforced concrete and the foundations were by Queensland engineering consultant, Russell J. McWilliam.

The road design provided a two-lane roadway of 26 feet (7.9 metres) width and a pedestrian walkway of 5 feet 6 inches (1.6 metres) width. The decking was originally hardwood planks, covered with asphalt. Much later, in 1993, all timber was replaced with precast concrete panels. A minimum height of 46 feet (14 metres) above high-water level was provided for shipping clearance.

Construction by Taylor

Work on site commenced in early 1932, with the pylons completed by March 1935. All suspension cables were in place across the river by June 1935. Extensive use of local labour was made, with work carried out without the use of river plant. There were no reported fatalities during construction and the bridge was completed and first tested on 4th January 1936, not long before the official opening was scheduled.



The Indooroopilly pylon under construction in 1933. Photo: BCC.

The Walter Taylor Suspension Bridge

The elegant art deco style pylon structures rise 136 feet (41.5 metres) above the foundations, and contain 9 rooms suitable for habitation, an unusual feature and the only one of its kind in the southern hemisphere. All major fabrication was carried out on site, with 1000 tons of steel sections from BHP and 80,000 rivets used. Cement was supplied locally by Qld Cement & Lime Co. The total construction cost was £85,000, excluding resumptions and approach road works.

Operation & Legacy since 1936



The bridge photographed in 2019, featuring a freshly painted (?) pylon. Photo: Wikipedia.

After being opened as the *Indooroopilly Toll Bridge* by the Governor of Queensland, Sir Leslie Wilson, on 14 February 1936, the new crossing provided tremendous motivation for residential development on the southern side of the river, due to improved cross river access for western suburbs.¹



Official opening of the Indooroopilly Toll Bridge, Feb 14, 1936. Walter Taylor is the man at right. Photo: State Library Qld 1-52980.



First traffic on Opening Day, 1936. Photo: BCC-BCA1123-7.



The bridge's franchise allowed the private operator to charge tolls, initially 6 pence per car and light truck but only including the driver, while passengers were charged another penny each. These were paid at the toll gate on the Indooroopilly side under the pylon and the total profit in its first year of service was £2581.

Image (at Left); Collecting the tolls in the early days. Photo: BCC Archives.

The Indooroopilly (north) pylon was occupied by the Toll Master, with the southern Chelmer tower occupied by toll collectors and bridge maintenance. The original Toll Master was Morton John Green, who was later succeeded by his son Ron Green who, remarkably, had seven children growing up in their bridge home. Three generations of the Green family lived in the Indooroopilly pylon for over 70 years, until 2010, when the last family members moved out. An interesting video of life in the bridge is on the following site:

<https://overthewaltertaylorbridge.com.au/walter-taylor-bridge-to-urs-australia-only-inhabitable-bridge/>

The Chelmer pylon had a large room nicknamed *The Ballroom*, and other rooms used as a kiosk and boathouse beneath road level to cater for swimmers at the Chelmer Sands beach, once located below the bridge.

When the franchise expired in 1955, the tolls were removed, and the bridge ownership was transferred to the Brisbane City Council. The original investors did quite well, with shares paying an annual dividend of 14%, and at the end of the franchise, \$18 capital was returned for each share.



The Toll Master's Family Dining Room in the North Pylon. Photo: BCC - B120 - 31161.

¹ A booklet, *The Indooroopilly toll bridge : a souvenir of the official opening day* is at: <https://nla.gov.au/nla.obj-52814844/view?partId=nla.obj-96998899>

The Walter Taylor Suspension Bridge

After the toll franchise expired, the Indooroopilly pylon was then rented to the Green family, with the Chelmer pylon rented to university students through the 1970s and 1980s. Domestic accommodation in the pylons continued to be leased until 2010, after which the rooms were converted to meeting rooms. Since 1968, Brisbane City Council has carried out extensive refurbishments to the suspension cable wires and connection plates, installing additional corrosion protection, replacing wooden decking with pre-cast concrete panels, replacing all bolts and joint plates, and adding reinforcements to extend the life of the bridge.

Since 1926, all other bridges built using the Florianopolis/Steinman design have been demolished, except for the original one in Brazil, although even it has been modified and is not functioning as originally intended. This makes the Walter Taylor Bridge the only example of this type world-wide still in operation as originally designed.



An aerial view of the bridge on Opening Day 1936. Note Railway bridge at left and Ferry jetty at upper right Photo: BCC-BCA1123-10.

Tributes to Walter Taylor

In 1956, a year after Taylor's death, and at the expiration of the franchise to the *Indooroopilly Toll Bridge Co Ltd*, a new plaque was erected renaming the bridge the *Walter Taylor Bridge* in Taylor's honour, and these words from the Chairman of the Board, Mr W.H. Green, were read:

As you are assembled here to honour the memory of a great citizen and Christian gentleman, I as Chairman of the company, the sole remaining associate with Walter Taylor in the flotation and completion of this great undertaking, desire to record my appreciation of the ability, steadfastness, devotion and character of this truly great man.

In October 1992, the Walter Taylor Bridge was listed in the Queensland State Heritage Register. In 2011 Taylor was posthumously awarded the Queensland University of Technology's Distinguished Constructor Award and inducted into their Construction Hall of Fame. Since 1936, Walter Taylor's bridge has continued to serve residents and commuters as a most elegant crossing of the Brisbane River, and will proudly continue to do so well into the future.

Acknowledgements

Brisbane City Council Archives – various photographs.

Stuart Rothwell-MIEAust., EHQ – *The Walter Taylor Bridge – Florianopolis Australis*, a paper presented to the New York City Bridge Engineering Conference, 2019.

The Remarkable Walter Taylor, a publication by Noel Davis for the Oxley Chelmer History Group, 2011.



An undated, but fairly recent photograph of the Walter Taylor Bridge, viewed from the south-west. The trusses in the background belong to the adjacent railway bridge. Photo: BCC-B120-6152.

Belconnen Naval Transmitter Station

A heritage of wartime communications

By Keith Baker

Introduction

The Naval Communications facilities in Canberra were of major significance in the war history of our nation and of the Royal Australian Navy (RAN). With the outbreak of World War 2, HMAS Harman, with the Transmitter Station at Belconnen and the Receiver Station at Bonshaw¹ proved vital to the strategic deployment and operation of naval forces in the Pacific and Indian Oceans.



Belconnen Naval Transmitter Station, viewed from Gungahlin, before demolition of the three Low Frequency Aerial masts.

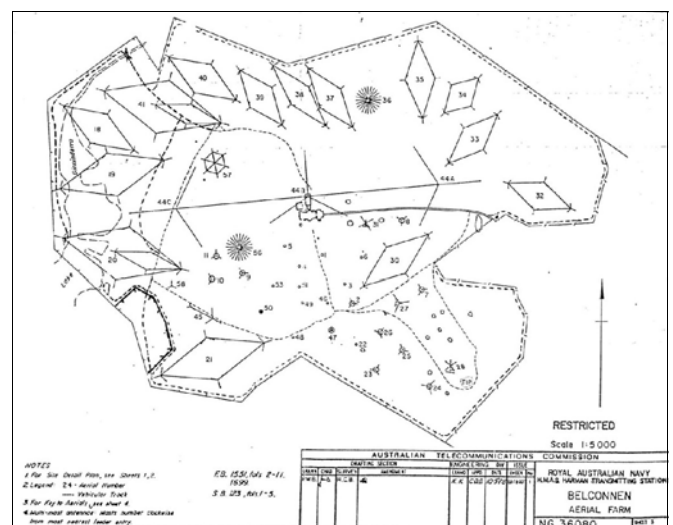
Photo Keith Baker.

The Naval Transmitter Station was designed in Australia as a key strategic radio communications facility on the eve of World War 2 and constructed at Belconnen in the Australian Capital Territory (ACT) in 1938-39. As the most powerful Low Frequency (LF) transmitting station in the Southern Hemisphere, it communicated directly with Australian and allied ships and submarines, and with other allied communication stations such as in Singapore and Rugby in the UK. Over time the station expanded to incorporate a wide range of High Frequency (HF) transmitters. In 2005 the station was decommissioned as facilities were established elsewhere and the land, which was by then surrounded by Canberra suburbs, became potentially available for redevelopment. The transmitter building contains a rare 250kW LF valve-operated transmitter that is largely original as well as several generations of HF transmitters, controls, ancillary equipment and aerial switching exchanges. Until decommissioning, the station had 48 HF aerials of seven distinct types and three 180m lattice towers which had supported the 44 kHz LF aerial. While the buildings and contents remain, the LF aerial towers have been demolished and the HF aerials removed, with a “representative” sample in storage for later interpretive display.

History of its Siting and Construction

Before and during World War 2, RAN communications were very much associated with the Royal Navy as part of a network that encompassed the British Empire and its dominions. RAN communications had been established at Williamstown (Vic) in 1913, and later at Flinders Naval Depot (Vic) and Garden Island (NSW). Australia was invited to join in setting up a British worldwide naval communications system in 1926. Canberra was chosen as the site for the RAN Broadcast Station, but the depression delayed its commencement until there were further signs of war.

Standard Telephones and Cables Pty Ltd. (STC) of Sydney designed the LF transmitter and aerial systems at Belconnen for the RAN in 1939. It was designed as a 200 kilowatt, 44 kHz omni-directional transmitting station, with a series of smaller HF directional aerials for point-to-point communication to specific naval defence locations around the world. The rhombic directional aerials were on guyed timber poles and were completed progressively during 1939, allowing the first transmission in December 1939, three months after the start of World War 2.



Layout of the aerial farm, with the Transmitter Building shown in the centre.
Source: Dept. of Defence Antenna Manual.

¹ All these Naval Stations - HMAS Harman, Bonshaw and Belconnen were inside the Australian National Capital Territory – a long way from the sea. See: https://en.wikipedia.org/wiki/HMAS_Harman

Belconnen Naval Transmitter Station

LF Transmitter

The LF transmitter equipment forms an outstandingly impressive feature of the Transmitter Station, with its vacuum tubes the size of waste paper baskets, aerial loading coils that reach from floor to ceiling on laminated timber and porcelain formers, and switches and cables mounted on high voltage insulators. A control room situated between the LF and HF transmitter rooms has an assortment of equipment on desks and in

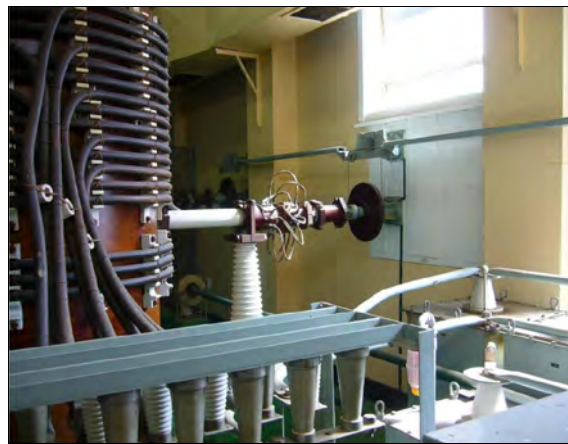


Air cooled valve in transmitter cabinet.

Photo: Keith Baker.

cabinets broadly matching the more than six decades of history of the equipment in the rest of the building.

For obvious safety reasons the BLR44 room housing the high powered output of the transmitter was closed to personnel while the transmitter was operating. The strength of the electromagnetic field in the room was such that metallic fasteners were not allowed in the tiled ceiling, and fluorescent tubes in the room were reputed to glow whether they were switched on or not.



Tuning coil and capacitors.

Photo: Keith Baker.

Much of the electronic componentry in modular cabinets of the transmitter probably dates from 1961 when the power output of the transmitter was increased to 250kW and modifications were made to allow the transmission of radio teletype as well as Morse code. Noticeable changes include the present transmitter valves being air-cooled whereas the original valves were water-cooled. However the electromechanical components and huge coils appear to be original from 1939 and external porcelain insulators bear that date.



Solid state rectifiers.

Photo: Keith Baker.

A single feed from the transmitter projects through a corona ring and circular opening in the brick wall of the transmitter building. From there the feed was supported on large insulators mounted on steel supports, and thence to the LF Aerial. The Feeder system consisted of copper conductors forming two wire cages arranged around a series of rings.

LF Aerial

The three 600ft (183.5 m) high guyed steel lattice towers from which the Low Frequency (LF) aerial was suspended, were designed and installed by Johns and Waygood of Melbourne and were completed in June 1941. The LF aerial became operational in June 1942. It was modified in 1961 to increase its power handling capability from 200kW to 250kW, but it remained substantially original until it was decommissioned in December 1995. In 1996 the aerial array was lowered from the steel towers, which remained in location until 2007. The Low Frequency Aerial system, which was designed by STC in 1939 and constructed by STC and Johns & Waygood in 1941, consisted of two inverted L shaped aerals suspended from the three towers.

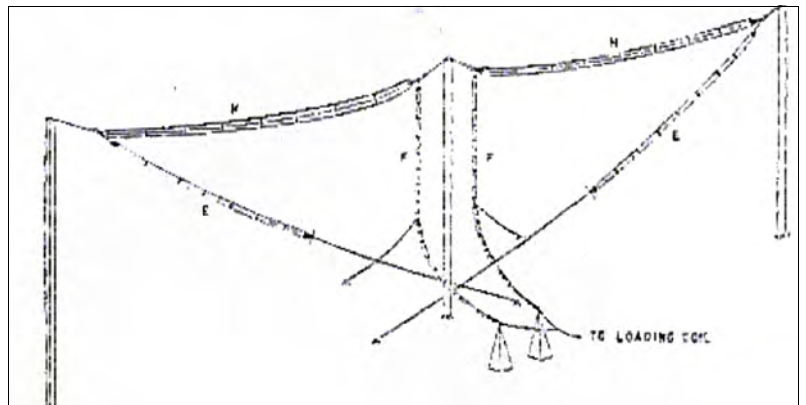


Diagram of the 1961 LF Aerial configuration. Source: Dept. of Defence Antenna Manual.

Belconnen Naval Transmitter Station

The three-sided galvanised steel lattice towers were of bolted construction, in three sections vertically, with guys in three directions from the top of each section. The towers were each fitted on a ball jointed base insulator at ground level and with winches in the lower section, for hauling the aerial array into place with steel cables. The central tower had a double drum winch, while the outer towers had single drums. Slip clutches on each winch limited the tension on each cable and hence on the array, to less than eight tons. A steel ladder with safety cage ran inside each tower adjacent to one of the vertical legs, allowing maintenance access to the full height.



The antenna array consisted of two identical halves. Each feeder connected to a vertical radiating element of 12 wires forming a cage running the height of the tower. The top loading element (forming the inverted L) consisted of 8 conductors arranged in a cage configuration 10 ft in diameter. These horizontal elements provided capacitance between them and the buried earth mat. The array was supported between the three masts spaced about 1,200 ft apart.

Image at Left: Insulated base of the central LF Tower, showing arcing horns, dual winch inside tower structure for hoisting the aerial assembly, and the caged access ladder.

Photo: Keith Baker.

additions were not particularly successful and caused maintenance problems.

Insulators were of a long tubular glazed ceramic form with moulded disks at each end to provide a water shed. They were cemented to metal clamps at each end. The insulators were nearly 5 ft long and 6 inch diameter, with two water sheds of larger diameter. Insulators between the towers and the aerial cable were fitted with corona rings made of copper tube formed into a circle to reduce the intensity of the electrical field across the insulators.

Earthmat

An earth mat consisting of 144 copper radial wires was installed in an elliptical form 3200 feet in length and 2000 feet in width with its long axis along the line of the LF towers. It remains 9 inches underground. It extends beyond the LF aerial guys of the outer masts, covering most of the area of the aerial farm.



HF transmitter cabinets.

Photo: Keith Baker



The lower section of an LF Aerial Mast.

Photo: Keith Baker.



Insulators with corona rings.

Photo: Keith Baker.

HF & UHF Transmitters and Aerials

HF communication has been the constant, if less spectacular feature of the station. A range of more modern transmitters remain in modular cabinets, unchanged from when the station was decommissioned in 2005.

Until 2011 the remainder of the Belconnen Naval Transmitting Station aerial farm consisted of a vast assortment of functional antennas, their associated feeder systems, and a tower supporting a microwave dish for inter-site communication with HMAS Harman.

Belconnen Naval Transmitter Station

The earliest HF antennas were fixed rhombic aerials, formed in diamond shapes with aerial wires suspended on timber masts. The 1939 timber masted aerials were replaced in 1983 using lattice steel masts, generally in the same locations with original footings.

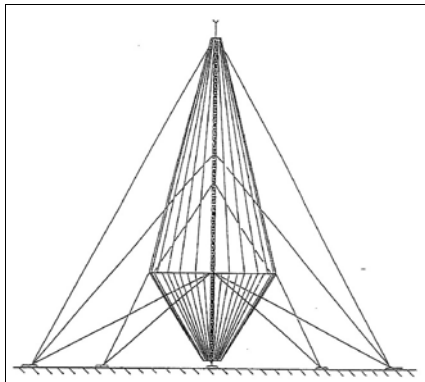


Diagram of a Biconical Monopole.
Source: Dept. of Defence Antenna Manual.

The next most common HF antennas were bi-conical monopole omni-directional aerials installed from 1958. They consisted of two vertical intersecting cones of suspended conductors around a hoop.

Rotatable log periodic aerials were installed from 1978. These were directional antennas consisting of dipoles with many parallel elements (somewhat like a television aerial) to give a narrow beam, which could be remotely controlled to point in the desired direction.

A single log spiral aerial was constructed in 1972 with six 9 metre poles in the form of a hexagon, supporting a shallow inverted cone aerial to transmit a skywave in all directions.

A fixed vertical log periodic aerial from around 1970 was decommissioned in 1996.



An Omni Vector Aerial.

Photo: Keith Baker.

Probably the most unusual antennas were the omni vector aerials installed from the late 1960s and 1970s. They were of varying sizes depending on the HF frequency they were designed to operate on, and were used as either directional or omni-directional by remotely switching antenna elements. They were each constructed with a conical aerial around a central column, resembling large or small Hills Hoists [an Australian clothes dryer].

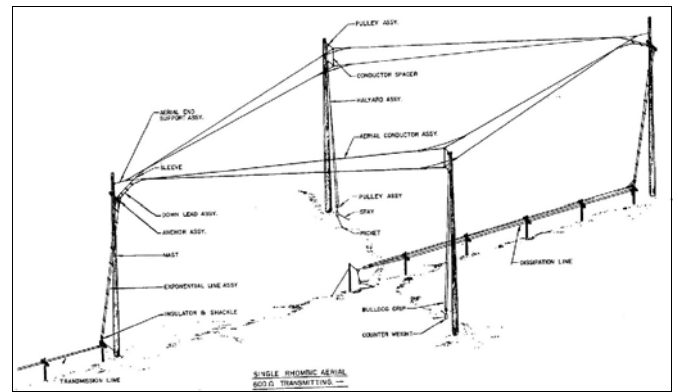


Diagram of a Rhombic Aerial. Source: Dept. of Defence Antenna Manual.



Rotatable Log Periodic Aerial.

Photo: Keith Baker.

HF Aerial Switching

Two generations of aerial switching exist in the main building. In an upstairs room the earlier aerial exchange consists of sections of insulated bus bars that, through careful geometry, can be inserted or removed in various predetermined locations to connect a selected transmitter to the desired aerial or to a dummy load. A later much more compact aerial exchange near the control room allowed a similar switching function more conveniently by a series of switches.



Second generation switchable aerial exchange.
Photo: Keith Baker.



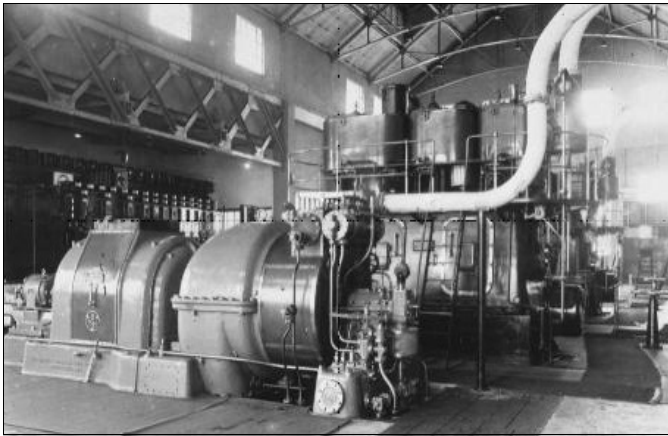
Original aerial exchange with links at right to be plugged into the aerial/transmitter matrix on the left.
Photo: Keith Baker.

Belconnen Naval Transmitter Station

Power Supply

During WW2 the Belconnen station was powered directly from the Kingston Powerhouse, also in the ACT. A steam turbo-alternator installed there in 1927 supplied a dedicated high voltage line to Belconnen some 12km distant. The switching load with the LF transmitter was such that an electrical mechanic who worked at Kingston at the time indicated that Morse code could be heard in the Powerhouse from the changing load on the alternator.

A much more recent diesel alternator provided back up power, from a separate powerhouse building adjacent to the transmitter building. Sadly the powerhouse now holds the limited sample of HF aerials that could have been retained in location in the grassland that has been given stronger heritage recognition than the diversity of aerials.



Steam driven turbo alternator at Kingston Powerhouse.
Source: Australian National Archives A3560, 3588.

Wartime and Later Operation

Morse code operators at the station and those communicating with it affectionately referred to it as Bels. It was a vital wartime communications link and a homecoming beacon for returning servicemen. For years spanning the Korean and Vietnam wars it was an important part of the Australian defence communication network, and reputedly had a role in communications for the Melbourne Olympic Games. The navy left the site in 1995 and operation and maintenance was taken over by civilian contractors, although the Defence Department retained ownership and responsibility for the planned disposal.

Heritage Significance

The station has established significance for the role it played in WW2 and the development of naval communications. The transmitting equipment, aerials, buildings and surrounding native grasslands were entered in the Register of the National Estate (RNE) in 2002, and following a heritage study by the University of Canberra, was nominated for emergency listing on the Australian National Heritage Register. By comparison with the World Heritage listed Varberg Radio Station in Sweden, a case was being developed by Dr Brian Egloff of the University of Canberra for World Heritage consideration.



A Section of one demolished LF Tower. Photo: Keith Baker.

Conservation and Loss

While RNE listing did not give automatic protection, changes to Australian heritage legislation ensured Belconnen Transmitter Station was included in the Commonwealth Heritage list in 2004, thus requiring its owner, the Department of Defence, to obtain approval from the Minister for the Environment and Heritage for any changes associated with its disposal. Such referral was intended to ensure that heritage significance is protected while the place remains in Commonwealth ownership, and steps are put in place to ensure appropriate conservation after disposal action.



A limited representative sample of aerials in storage.
Photo: Keith Baker.

Defence considered the Low Frequency aerial masts were a maintenance liability and sought approval for their demolition, while Dr Egloff sought emergency listing on the National Heritage List. In a 13 page response Minister Campbell accepted that the transmitting station, including the Low Frequency aerial masts, had potential national heritage significance, but strangely ruled that the significance was associative and not bound up in the fabric which could be demolished. Defence was required to make a photographic record and agreed to retain representative samples. This study was undertaken by Godden Mackay Logan (GML) but the report was not made widely public.

Belconnen Naval Transmitter Station

Future of the Site

The Low Frequency masts have been demolished despite Engineering Heritage Australia and the National Trust (ACT) jointly nominating Belconnen Naval Transmitter Station as a threatened place under the National Most Endangered Heritage Program. Dr Egloff also nominated it to the World Monuments Fund list of 100 Most Endangered Sites. The concern is not only for the way this site has been allowed to be managed under Federal legislation, but the precedent it could create for Australian places with national or World Heritage values.

Where the significance can be defined as associative, the question remains of what protection does the Environment Protection and Biodiversity Conservation Act 1999 or its successor provide, to prevent the physical evidence being removed or demolished? A revised publically available conservation management plan is awaited from Defence, hopefully including future use of the Transmitter Building to maintain the fabric and preserve the highly significant transmitting equipment.

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Note about the author:

Keith Baker FIEAust CPEng (Ret) is an electrical engineer and past chair of Engineering Heritage Australia. Through EHA and the National Trust, he has advocated the conservation of the transmitter station and made representation to prevent the demolition and removal of the aerial systems. With EHA colleague Robert Breen, a retired RAAF communications officer, he undertook a heritage survey of the aerals and external features as part of a University of Canberra study of the site in 2001.



Three aligned LF towers viewed across lake Ginninderra.

Photo: Keith Baker



Belconnen Naval Transmitter Station, Canberra.
Decommissioned Helix Room and feed supports to former LF Transmitter Aerial. Photo: Keith Baker.